THE IRON TRADE REVIEW

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# Railroad Buying is More Active

## Demand for Export Very Heavy—Prices Generally Advancing—Mills and Furnaces Conservative

WHILE many rumors of steel works consolidations disturb the stock market, the iron trade moves steadily along with increasing prosperity. To the heavy buying for export and by automobile manufacturers is now added the placing of orders much more freely by the railroads.

**Pig Iron**

Renewed inquiry for pig iron for export is a feature of the market. Some iron is being shipped from Canada via Chicago and New Orleans to France. Eastern basic has touched a new figure at $17.75, delivered, at which a Harrisburg company took 7,500 tons. Recent sales of the Marting Iron & Steel Co., Ironton, O., to two eastern buyers amounted to 19,000 tons. The General Electric Co., which has been in the market for 32,600 tons of various grades, has placed 5,000 tons with Buffalo makers, and some additional tonnages elsewhere, but has not covered for the full amount inquired for. The appearance of some re-sale iron in Cincinnati at $11.50, Birmingham, for No. 2, has had a tendency to weaken the southern market. The re-sale iron, amounting to from 75,000 to 100,000 tons in the Cincinnati territory, was purchased at from $9.50 to $10 per ton some time ago. Large purchases were also made by New York speculators.

**Plates and Sheets**

Owing to the scarcity of semi-finished material, some manufacturers of plates and sheets have been making sales of steel and a scarcity of the finished product seems probable. Already prices are advancing and one eastern company is asking 1.45c, Pittsburgh, for plates, for delivery the remainder of this year.

**Shapes and Bars**

The outlook is that some structural mills will make a new record for shipments for this month. The number of large contracts pending is not, however, large. The very active demand for bars for export is unabated. Some additional sales have been made and much greater tonnages are pending. Automobile buyers are also placing big orders. Futile efforts are being made to place large contracts for barbed wire for export.

**Prices**

One large independent company has done considerable contracting in shapes, plates and bars for delivery up to April 1 at 1.40c, Pittsburgh, but the Steel Corporation and most of the independents are declining to quote for first quarter delivery.

**Railroad Buying**

The railroads are beginning to realize that the filled-up condition of mills may mean long deferred shipments on railroad orders and the placing of business by them is much more active. Car orders for the past week have amounted to between 5,000 and 6,000 and numerous inquiries are pending. The Pennsylvania railroad has distributed 120,000 tons of rails among a number of mills.

**Coke**

In the Pittsburgh district, a sale of a large tonnage of furnace coke has been made on a sliding scale basis. The Northern Iron Co. has contracted for 15,000 tons of furnace coke per month for delivery through next year for its two furnaces in New York state at from $2.25 to $2.35, ovens. The Claire furnace at Sharpsville, Pa., has been blown in after being idle for five years.

**Machinery**

Orders for lathes for export now pending and likely to be closed at any time include from 3,000 to 4,000 machines, most of which will be delivered after Jan. 1, because manufacturers cannot give earlier delivery. There is, however, an order for 1,000 lathes which probably will be closed within a few days. French, English and Russian buyers are picking up all the machines they can find. There is an increasing demand from abroad for milling machines and radial drills.

# THE OPEN HEARTH

## Chance to Establish an Industry

ON ACCOUNT of the building of numerous benzol plants in connection with by-product coke plants, the question of what the tariff policy of the government will be in regard to aniline dyes is a matter of increasing importance. It is certain that the sale of the benzol after the war will not be very profitable unless it can be converted into dye products. The question then is—will congress make it possible by a protective tariff to develop the manufacture of aniline dyes in this country on an extensive scale?

The manufacture of these dyes has been carried on in a limited way in the United States for many years and repeatedly has been the subject of investigation by congress, or by tariff commissions. In the testimony presented at various times and recently republished by the Benzol Products Co., some very interesting information is given. In hearings before a tariff comission as far back as 1882, it was shown that the industry had been struggling with some success, but the principal trouble seemed to be that while there was a tariff on aniline dyes dating back as far as 1864, the semi-finished material was admitted free of duty. This policy prevented the development of the primary products, but congress did not take kindly to the suggestions that were made and the duty, which had been 50 cents per pound and 35 per cent ad valorem from 1870 to 1883, was reduced in the latter year to a straight 35 per cent and continued at that rate until 1894, when all coal tar dyes were reduced to 25 per cent. There was excellent reason for believing that if the duty had not been lowered in 1883, all of the aniline colors needed in this country would be manufactured within the borders of the states. Further reductions in the tariff on various dyes were made in later years, especially by the Underwood act of 1913, and nothing except the almost complete exclusion of German dyes, due to war conditions, has furnished any hope of the industry being built up in this country. Now, however, as foreign competition is almost excluded, efforts are being made to establish the industry on a sound basis.

Dr. Thomas H. Norton, government chemical and dyestuff investigator, told the American Institute of Chemical Engineers at a meeting held in connection with the National Exposition of Chemical Industries, in New York last week, that not only have American chemical and color industries undergone an extraordinary expansion since the war began, but exports are increasing by leaps and bounds. He said chemicals showed an export increase in value of 72 per cent for this year as compared with 1914. The chemical export of June, the expert said, was 161 per cent greater than that of the same month a year ago. Relative to the progress made in making dyestuffs in this country, the speaker said that within a short time American color makers would be able to supply the requirements of users here and produce for export trade.

Until, however, some assurance can be furnished that protection will be given, capital will not be freely invested in this kind of manufacturing. This is a subject which should receive the immediate attention of the federal trade commission, which can easily obtain the necessary information to submit to congress, showing that the making of dyes can be carried on successfully in this country and that a reasonable protective tariff should be provided until the industry becomes thoroughly established.

## Suggestions Wanted

MAINTENANCE of adequate plans for quick utilization of all of the present industrial capacity in the United States to make war material or to manufacture machinery when needed is expected to be given prominent consideration when legislation looking to national defense comes before the next session of congress. It seems evident that, if some practical suggestions to have this capacity available at all times could be offered, congress would be in a mood to act upon them. Industrial mobilization and the lack of it denoted by the warring nations of Europe have impressed upon the minds of military authorities more than ever the necessity of being ready to turn upon a moment's notice to the manufacture of munitions to meet an invasion. Germany's preparedness and England's unpreparedness in this direction stood out in striking contrast when hostilities broke out.

It is known that authorities in the navy and war departments are giving considerable study with regard to industrial mobilization. Sentiment in these circles is apparently unanimously in favor of seeing that the present capacity to make war material, machinery and tools be permanently maintained or arrangements so made that it can be restored quickly. The matter has not reached the point where it has been determined to recommend legislation for this purpose, but even in the event neither department makes such a suggestion it is not improbable that public opinion is so strongly in favor of the idea that action looking toward industrial mobilization would be taken by congress.

When war orders began to pour into the United States from Europe, the war and navy departments watched with much interest to see what response

# THE OPEN HEARTH

would be made by industrial institutions. These departments were anxious to know whether the industries could readily adapt themselves to the manufacture of the materials wanted. That they did meet the situation so successfully and promptly was a matter of surprise on the part of military circles. While American ingenuity was expected to assert itself, it had not been expected it could be exerted to the extent that it was. The manner in which new plants were built and old ones converted from the regular lines to the new lines desired, and allied activities of the manufacturers of this country were shaped to meet the most extraordinary situation was considered remarkable.

The government took such an interest in the new condition that Secretary Daniels, of the navy department, and Secretary Garrison, of the war department, sent out inquiries to manufacturers, asking whether they would give confidential information to their departments, stating just what war material and machinery they could produce and the time required. Quick response came from every manufacturer and the data have been compiled and indexed, so that the departments have at their fingers' ends the present capacity of these plants. It is appreciated that the government's arsenals and navy yards are not capable of producing a sizeable percentage of munitions that would be needed in case of a war of any proportions. It would be absolutely necessary to call upon the manufacturers, and it is desired that, in the event such a call were made necessary, immediate production could be made. The big question is as to what inducement could be offered the manufacturers to maintain or be prepared to immediately restore their present capacity. One who could submit a satisfactory answer would be rendering a real service to the country. It is self-evident that, if the manufacturer is given no such inducement, he cannot afford to continue those units of his old plants, or his new plants, designed temporarily for the manufacture of war material and machinery. It seems apparent that, in the absence of such inducement, although the nation is better prepared than ever before in this line of defense, many of the large additions made would go for nothing, meaning a loss that cannot be estimated in dollars and cents—a loss that could mean national peril. Subventions, or the placing of contracts with private plants where heretofore they have gone to government navy yards and arsenals, presented themselves as ideas for industrial mobilization, yet it has been conceded that they have been suggestions only, and, if found practical, might be merely a partial solution. It has been pointed out that manufacturers themselves might be able to submit suggestions along this line, and we take pleasure in urging all manufacturers who have ideas on the subject to submit them to the Washington authorities. One suggestion which we hereby submit is that all thought of the government going into the manufacture of munitions more extensively or of engaging in the making of armor plate be abandoned as one means of encouraging private enterprise.

It may be expected in advance that certain members of congress, as well as others, will assail the plan of industrial mobilization and ascribe it to the mythical "war trust", but the attack would in all probability be weak in the face of the aroused feelings of the nation, which are demanding adequate national defense. The plan is not in any way meant to make an "armed camp" of the United States. It is the intention to constitute it along sane and safe lines, and, if it is found impractical to maintain the present capacity for the making of war material and machinery, it is felt provision should be made to see that at least a proper portion is maintained, and the remainder restored upon short notice. The plan, so worked out, would not run counter to the note sent to Austria by Secretary of State Lansing on Aug. 12, refusing the absurd request of that country for the prohibition of the export of munitions from the United States.

The plan of industrial mobilization could be so arranged that it would entirely avoid any tendencies toward militarism, and would be a matter of self-preservation only, and, if need be, war orders could be placed in the markets of the world as well as in the United States. Incidentally, it has been observed that if Germany had not been sufficiently mobilized in an industrial way, the allies' blockade would have meant the defeat of Germany and her fellow-belligerents long ago.

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The transfer of the Midvale Steel Co. to new ownership, with William E. Corey as president, marks the termination of a policy of secretiveness which prevailed with the company for many years, a policy which was carried so far that for years the company refused to give statistical information to James M. Swank for publication in his directory of iron and steel plants. A more enlightened and progressive policy will be adopted by Mr. Corey, who, as president of the United States Steel Corporation, carried out a policy of letting the public know what it had a right to know about the affairs of the company. Under his able management, the Midvale company will attain greater success than ever and be a factor of increasing importance in the steel business of the country. In spite of some of its narrow ideas, the company became a factor of importance in the manufacture of armor plate.

## Prices Present and Past

*Quotations on leading products September 29, average for August, 1915, average for June, 1915, and average for September, 1914. Prices are those ruling in the largest percentage of sales at the dates named.*

| | Prices Sept. 29, 1915. | Average for Aug., 1915. | Average for June, 1915. | Average for Sept., 1914. |
|---|---|---|---|---|
| Bessemer pig iron, Pittsburgh.. | $16.95 | $15.89 | $14.58 | $14.90 |
| Basic pig iron, Pittsburgh..... | 15.95 | 14.89 | 13.54 | 13.90 |
| No. 2 Fdy. pig iron, Pittsburgh | 15.45 | 14.70 | 13.45 | 13.90 |
| Northern No. 2 Fdy., Chgo.... | 14.25 | 13.38 | 13.00 | 13.50 |
| Lake Superior Charcoal, Chgo.. | 16.25 | 15.75 | 15.25 | 15.75 |
| Mall., Bess., Chgo..... | 15.00 | 13.38 | 13.00 | 13.50 |
| Southern No. 2, Birmingham... | 11.50 | 11.13 | 9.55 | 10.00 |
| Southern Ohio No. 2, Ironton.. | 14.50 | 13.69 | 12.50 | 13.00 |
| Basic, eastern Pa..... | 17.25 | 15.25 | 13.75 | 14.00 |
| No. 2X Virginia furnace..... | 13.50 | 12.50 | 12.50 | 12.50 |
| No. 2X foundry, Philadelphia.. | 16.25 | 15.50 | 14.25 | 14.25 |
| Ferro mang., Balti., (prompt).. | 115.00 | 105.00 | 105.00 | 80.00 |
| Bessemer billets, Pbgh..... | 25.00 | 23.00 | 19.87 | 21.00 |
| Bess. sheet bars, Pbgh...25.00 to | 26.00 | 24.00 | 20.37 | 22.00 |
| Op.-h'th sh. bars, Pbgh...26.00 to | 26.50 | 25.00 | 20.37 | 22.00 |
| Open-hearth billets, Pbgh..... | 26.00 | 24.00 | 19.87 | 21.00 |
| Steel bars, Chgo..... | 1.54 | 1.49 | 1.39 | 1.38 |
| Steel bars, Pittsburgh..... | 1.40 | 1.30 | 1.20 | 1.20 |
| Iron bars, Philadelphia..... | 1.45 | 1.30 | 1.20 | 1.20 |
| Iron bars, Cleveland, local del'y. | 1.35 | 1.22 | 1.20 | 1.20 |

| | Prices Sept. 29, 1915. | Average for Aug., 1915. | Average for June, 1915. | Average for Sept., 1914. |
|---|---|---|---|---|
| Iron bars, Chgo. mill..... | $1.35 | $1.23 | $1.15 | $1.07 |
| Beams, Chicago ..... | 1.54 | 1.49 | 1.39 | 1.38 |
| Beams, Pittsburgh ..... | 1.40 | 1.30 | 1.20 | 1.20 |
| Beams, Philadelphia ..... | 1.509 | 1.409 | 1.359 | 1.30 |
| Tank plates, Pittsburgh..... | 1.35 | 1.30 | 1.15 | 1.185 |
| Tank plates, Chicago..... | 1.49 | 1.44 | 1.31 | 1.38 |
| Tank plates, Philadelphia..... | 1.509 | 1.409 | 1.359 | 1.30 |
| Sheets, blk., No. 28, Pbgh..... | 2.00 | 1.83 | 1.80 | 1.95 |
| Sheets, blue an., No. 10, Pbgh. | 1.60 | 1.36 | 1.35 | 1.40 |
| Sh., galv., No. 28, Pbgh., nom. | 3.50 | 3.93 | 4.46 | 2.95 |
| Wire nails, Pittsburgh..... | 1.75 | 1.61 | 1.55 | 1.55 |
| Connellsville fur. coke contr.... | 2.00 | 1.75 | 1.65 | 1.75 |
| Connellsville fdy. coke, contr... | 2.40 | 2.25 | 2.25 | 2.35 |
| Heavy melting steel, Pbgh..... | 14.00 | 13.38 | 11.75 | 11.44 |
| Heavy melting steel, east'n Pa. | 15.00 | 13.75 | 11.25 | 10.75 |
| Heavy melting steel, Chgo..... | 12.00 | 11.50 | 9.37 | 9.37 |
| No. 1 wrought eastern Pa..... | 16.50 | 15.25 | 13.00 | 12.50 |
| No. 1 wrought, Chgo..... | 10.75 | 10.12 | 8.75 | 8.31 |
| Rerolling rails, Chgo..... | 13.50 | 11.75 | 10.00 | 10.87 |
| Car wheels, Chgo..... | 11.75 | 11.38 | 9.87 | 10.75 |

(For Additional Prices See Page 660.)

# Buying Pig Iron for Next Year's Use

### Although This Year's Delivery is Specified—Considerable Activity in Steel Making Grades

Philadelphia, Sept. 28.—A heavier tonnage is shown in pig iron sales and inquiries of the past week in eastern Pennsylvania territory, but these have been confined to a limited number of consumers. Steelmaking grades are strong and active, but foundry iron remains rather backward for forward positions and general interest among buyers is lacking. It is interesting to note that some consumers, apparently in the belief of a higher market early next year, are willing to buy at last quarter prices, iron which they will not need then and carry it over Jan. 1. The Pennsylvania railroad closed for 3,000 to 3,500 tons of special and wheel foundry and charcoal iron for Altoona, in which prompt delivery was specified. It is not intended that the metal shall be used until next year. The Baltimore & Ohio railroad, which usually buys in 100-ton lots for prompt shipment, closed for 1,500 tons for Baltimore and Newark, O., for last quarter. The Southern Railroad also bought several hundred tons of early iron for Lenoir City, Tenn. The Standard Cast Iron Pipe & Foundry Co. has inquired for 15,000 tons of forge and No. 3 for first quarter shipment to Bristol, Pa. This is a larger quantity than this consumer usually buys. Eastern Pennsylvania stove makers have taken several thousand tons for last and first quarter. For this year eastern Pennsylvania prices range from $15.50, furnace, upward for No. 2X, equivalent to $16.25 to $16.75, Philadelphia, and for next year about $1 higher. The furnace price for No. 2 plain for first quarter ranges from $16 to $16.25, furnace, and recent sales within that spread are noted. Virginia iron for this year is at a minimum of $13.50, furnace, for No. 2X and the quantity is limited at that figure. After Jan. 1 $14, furnace, for No. 2X generally is quoted. Eastern basic has advanced to a new high record for first quarter, a Harrisburg buyer taking 7,500 tons for that delivery at $17.75, delivered. The last previous tonnage sale of eastern basic for next year was $17.25, delivered. A New Jersey steelmaker bought 1,000 tons of prompt basic at $17, delivered. Recent sales of Ohio basic to eastern Pennsylvania consumers now are established at a total of 19,000 tons. A plate maker took 10,000 tons and a Philadelphia works 9,000 tons, both for first quarter. The commonly-reported price was $17.44, delivered, or $14, furnace. The General Electric Co. has closed for 2,000 tons of low phosphorus with two Lebanon makers. An eastern Pennsylvania steelmaker bought 1,000 tons of standard low phosphorus for this year at $25.62, Philadelphia, a new high price which makers now quote for that period. No new schedule for next year has been announced.

#### More Inquiry For Export

New York, Sept. 28.—Reappearance in quantity of export inquiries for pig iron has been a most conspicuous development of the week's market in this district. Pending lots of this kind now total about 20,000 tons, chiefly of steel-making grades of bessemer description. Most of the tonnage now in the market is for France, including two distinct lots of 5,000 tons each, one of 3,000 tons and another of 1,800 tons, all bessemer. Holland wants 1,500 tons of bessemer, while another European country which has not yet figured actively in negotiations here is in the market for 2,000 tons of foundry iron. Domestic buying has continued on a moderate scale during the past week. Sales principally have been in smaller quantities, so that the total volume has not been large. Outside this immediate district,

(*For complete prices see page 660.*)

an incident of note has been the closing by the General Electric Co. of orders against its recent large inquiries for first half or all year, aggregating 32,600 tons of foundry, malleable and low phospohrus. From the known size of some of the purchases made, it is considered doubtful whether the company bought the full amount of its inquiry. Some furnaces, it is learned, quoted on only portions of the tonnage asked for eastern plants. But 2,000 tons of the 4,000 tons of low phosphorus was bought and this went to the Lebanon, Pa., district. It is understood that the bulk of the high, medium and low silicon metal purchased for Schenectady, Pittsfield and Lynn, went to the Buffalo district at a price considerably below the price now commonly quoted there. Whether this business was taken by a producer in the immediate Buffalo district or nearby, has not been made clear. A New York state manufacturer of railroad supplies is asking for 5,000 to 10,000 tons of basic for first half. The American Brake Shoe & Foundry Co. has distributed about 3,000 tons of high and low silicon iron for eastern and western plants and still is in the market for 1,500 tons of high silicon. A sale of 1,000 tons of steel-making iron and another of 2,500 tons of special quality were made in this district in the week. A Bridgeport consumer is out for 800 tons of foundry and malleable for early delivery. Tidewater prices on No. 2X for this year remain from $16.25 upward and for first half at about $17 to $17.50 for No. 2X.

### Foundries More Active

Buffalo, Sept. 28.—Foundries engaged in the railroad supplies and accessories lines are showing signs of increasing activity, a condition that has been absent for many months. This factor of the consuming trade has been the weak wing of the pig iron movement for some time.

A point is being reached in the market where iron of any grade at $15 for last quarter and first quarter of 1916 is rapidly disappearing. A stiffening in the minimum of the range of $15 to $16.50, covering all grades, is expected to appear at any time now. Practically but one producing interest is in the market, the others being booked up for the remainder of the year and into 1916 to an extent that they are turning aside rather than looking for business, particularly at existing levels where more or less extended deliveries are sought.

One Buffalo interest booked 5,000 tons of foundry grades of the General Electric Co.'s large inquiry.

There is also an inquiry from other sources for 8,000 tons of malleable and 12,000 tons of basic under negotiation.

Shipments from furnaces continue in large volume. This flow has been kept up steadily for some time. Melters of the Buffalo territory are operating on about a 60 to 75 per cent basis. Some are working up to capacity while in some cases they are being worked at about 50 per cent.

### Pittsburgh Pig Iron Quiet

Pittsburgh, Sept. 28.—The pig iron market in the Greater Pittsburgh district is quiet and no change in the situation is expected until buying for the latter part of the year and the first and second quarters of 1916 begins. An Ohio river consumer has purchased at least 1,000 tons of standard basic iron from a southern Ohio furnace. Blast furnace stacks in the southern part of Ohio have been conducting a vigorous campaign to sell in this and eastern territory, but they have disturbed the price situation. Shipments of bessemer iron from the valleys to Italy continue heavy. Foundry and malleable grades are stiffening in price, but the $14.50, valley, quotation has not disappeared. Claire furnace at Sharpsville, which had been idle five years, was blown in a few days ago and Alice furnace was scheduled to resume operations last night. The stack of the Sharpsville Furnace Co., the output of which will be sold by a local broker, will be blown in about Nov. 1. Of interest to the pig iron trade was the purchase last week of approximately 100,000 tons of Lake Superior iron ore for shipment this year to the Youngstown Sheet & Tube Co., which paid prevailing prices.

### Heavy Shipments

Cleveland, Sept. 28.—There is very little inquiry or buying and leading agencies have shipped more iron than they have made this month. Prices are firm and furnaces are not urging buying at present for requirements for the first half of next year.

### Chicago Prices Firm

Chicago, Sept. 28.—Northern pig iron remains firm at $14.25, Chicago furnace, for No. 2 foundry and $15, Chicago furnace, for malleable, for delivery this year. First quarter of next year is bringing 50 cents higher than these quotations. Inquiry is active and comes mostly from small melters, although some larger users are seeking to fill their requirements for the early part of next year. It is believed considerable tonnages have been contracted for delivery after Jan. 1, although sellers are reticent as to the volume of their business.

Further advance in the price of northern iron from Chicago furnaces is scarcely expected for this year's delivery. Although Chicago prices are considerably lower relatively than in other markets, peculiar local conditions are such that present quotations are expected to continue through the remainder of the year. Some makers are of the opinion a further advance would reduce buying and prefer to sell their entire output at present prices than to pile iron at higher prices.

An agricultural implement maker in Wisconsin is seeking 600 tons of foundry iron and a northern Illinois agricultural implement maker is in the market for 2,000 tons of foundry iron, both inquiries being for delivery during last and first quarters. A northern Illinois builder of machines is asking bids on 1,600 tons of foundry iron on analysis which might be filled by northern or southern makers.

Southern iron is not active in this market, as northern prices are too low to permit competition. One southern maker has advanced prices, now asking $12.25, Birmingham, for last quarter, $12.75 for first quarter and $13.25 for first half.

While no southern iron appears to be available at $11.50, for No. 2 foundry, one maker is selling No. 1 foundry at a price which figures back to the equivalent of $11.50, Birmingham, for No. 2. It does not appear whether this maker would take tonnage of No. 2 foundry at $11.50, Birmingham, as no transaction has been put up to him on that analysis.

The Virginia Iron, Coal & Coke Co. has announced a new schedule of prices, all sales subject to confirmation as follows:

| | 1915 | First quarter and half |
|---|---|---|
| No. 2—X ..... | $14.00 | $14.00 |
| No. 2—Plain ..... | 13.25 | 13.50 |
| No. 3—Foundry ... | 13.00 | 13.25 |
| No. 4—Foundry and forge ..... | 12.75 | 13.00 |

### Southern is Stronger

Cincinnati, Sept 28.—The southern pig iron market is gradually growing stronger. Furnace quotations are now $12, Birmingham basis, for No. 2 foundry for this year's delivery, and from $12.50 to $13, Birmingham basis, for shipment through the first quarter of next year. Resale iron is obtainable in this market at $11.50, Birmingham basis, for prompt delivery. Southern Ohio iron is stationary at $14.50, Ironton basis, for No. 2 foundry, for the last quarter, and $15, Ironton basis, for the first half of next year. Sales are widely

(*For complete prices see page 660.*)

scattered and limited to lots not exceeding 300 or 400 tons, but the aggregate is better this week than last. Inquiries are much better in surrounding territories, such as St. Louis and Chicago, than in the Cincinnati district. A northern Illinois melter is out for 2,000 tons of foundry iron and a north eastern Indiana user is inquiring in this market for 1,500 tons of foundry grades.

### Fair Sales

St. Louis, Sept. 27.—Inquiries for pig iron in this market today consists of one for 500 tons and another for 300 tons of mixed northern and southern, with quite a number of scattering lots. Sales last week probably amounted to 8,000 tons, including two orders for 2,500 tons each of southern iron. Sales agents remain optimistic about the future, and believe that some good business soon will be in sight. Southern No. 2 is generally held at $12.50, Birmingham, for delivery over the remainder of the year and first quarter. Northern iron is quoted at $15, Ironton and Chicago, for first quarter delivery.

### More Southern Activity

Birmingham, Ala., Sept. 28. — More activity prevails in the pig iron market than for the past few weeks and two good sized orders are known to have been placed at $12 for No. 2 foundry, Birmingham.

Makers state that sales for September will equal and probably slightly surpass the production, which has been uniform for the past six weeks. One company contemplates blowing in another furnace, however, and a second maker has had a furnace undergoing repairs for the past two months which will be ready for operation within a week or so.

Some export inquiry is being made, but it is stated that the larger part of the month's business has been with middle western, western and southern consumers. That the price of No. 2 foundry will reach $12.50 within another month is generally considered probable. A southern pipe maker is now said to be in the market for a large tonnage.

One large producer states that in his estimation iron will reach $14 by the first of March.

## Pipe is Quiet

Pittsburgh, Sept. 28.—The filing of petitions for a referendum on a gas ordinance has held up an order for about 60 miles of steel pipe, which will be placed by the East Ohio Gas Co. for a line connecting Youngstown and Canton, O. The market for iron and steel pipe is quiet. Demand for merchant and locomotive boiler tubes shows some improvement and prices are reported to be firmly maintained.

## Ferro Shipments

**Promise to be More Liberal—Ferro-Silicons Are Advanced**

New York, Sept. 28. — Some improvement in the prospects for the licensing by the British government of more liberal shipments of ferro-manganese from England has appeared. Certain makers who for several months past have not been privileged to ship at all because furnace stocks of ore or finished metal did not reach the prescribed limits, now are arranging to resume shipments in October. One of these probably will ship in that period about 500 tons as against an average of about 1,000 tons monthly before the recent restrictions were imposed. Other makers are negotiating with the home government for the required license and 1,000 tons for one seller now are en route by the ANNAPOLIS and are expected to reach eastern ports the second week in October. This metal will be applied on former contracts.

English sellers of ferro-manganese report that they would have no trouble in disposing of large tonnages of this alloy at $100, seaboard, for future delivery, were they able to make any definite promises as to time of shipment. The sellers, however, still are obliged to leave the delivery an open question in view of the uncertainty regarding the licensing of shipments by the Euglish government, which continues. As it is, some buyers are disposed to take their chances in placing contracts in which the delivery period is specified as this year or first half, but with the usual qualification that it is subject to the ability of the seller to ship. These transactions usually have been in 100-ton and comparatively small lots, but one sale of 500 tons for first half is noted. Domestic ferro-manganese for forward delivery is held at $100, furnace. One sale of 600 tons for first half was negotiated on this basis. Prompt ferro-manganese in carload lots continues to command from $110 to $115, seaboard.

The manganese ore market remains stronger. A recent sale of 2,000 tons of Cuban manganese ore to a Pennsylvania maker of ferro-manganese was at 43 cents per unit, tidewater. Not much activity can be seen in spiegeleisen and domestic makers have little to offer for early delivery. About 500 tons of bessemer ferro-silicon for export are pending.

### Prices Advanced

Pittsburgh, Sept. 28.—Another advance of 50 cents a ton was announced today by sellers of bessemer ferro-silicon and silvery iron. The former material is held at $23, furnace, for 12 to 13 per cent; silvery iron is quoted at $18 for 8 to 9 per cent silicon for this year's shipment. Ferro-manganese continues to be offered at $100, seaboard, for future delivery. Despite heavy demand for 50 per cent ferro-silicon, which has been in evidence since the outbreak of the European war, prices have not changed in position. The scarcity of steel-making metals seems to be more acute and prices of most materials are nominal.

*(For complete prices see page 660.)*

## Furnace Coke

**Sold on a Sliding Scale—Producers Are More Cheerful**

New York, Sept. 28.—Contracts involving about 15,000 tons of furnace coke monthly for all of 1916 delivery, have been placed with Connellsville operators by the Northern Iron Co. for its two New York state furnaces. The prices paid ranged from $2.25 to $2.35, ovens, varying with the quality of the coke as both ordinary and low phosphorus grades were purchased. As recently noted, eastern consumers of furnace coke continue to be offered by certain operators, this fuel for first half or all of next year's shipment at $2.25, ovens, and several contracts have been placed on this basis. Not all the producers, however, have been willing to accept this price and they have been quoting variously at $2.30, $2.35 and $2.40, ovens, for next year's delivery. Some inquiry from eastern furnaces remains unacted upon.

### Cokemakers Hopeful

Pittsburgh, Sept. 28.—It is understood that a large tonnage of furnace coke has been sold on a sliding scale contract, providing a 20-cent a ton advance in the price of fuel for each advance of $1 a ton in the price of pig iron. A minimum figure attractive to the seller, was offered. Cokemakers are asking $2 a ton for shipment in October and as high as $2.25 has been quoted for delivery the last two months of the year. The foundry coke trade shows snap and prices gradually are advancing. The *Connellsville Courier* for the week ending Sept. 18 says production was 382,467, a decrease of 5,236 tons, compared with the previous week.

### Furnace Inquiry

Cincinnati, Sept. 28.—Two inquiries, aggregating about 70,000 tons, are pending from southern Ohio stacks. Another inquiry is out from Virginia for first half requirements for one stack. Buyers are refusing to pay present prices and as a result, transactions are being held up. Coke pro-

ducers are keeping only a sufficient number of ovens in blast to supply contracts, and are selling a large portion of their coal direct. Shipments on old contracts to foundries are heavy and are increasing slightly each month. No changes in prices are reported from either the Pocahontas, New River, or Wise county fields.

# Steel Bars

**In Very Active Demand—Heavy Sales for Export to Allies**

New York, Sept. 28.—Makers of large steel rounds and forging blooms suitable for shell manufacture have a bewildering assortment of tonnage now before them, which, it is estimated, runs to at least 250,000 tons. Two lots of 50,000 tons each for export are before sellers, while manufacturing buyers in this district alone who now are engaged or about to engage in shell-making, are inquiring for a total of about 50,000 tons more, for which there is good prospect of early closing. Included in this last amount are 20,000 tons for a railroad equipment shop. Large orders are commonly reported. J. P. Morgan & Co. during the past week are credited with placing with different makers about 75,000 tons of blooms and rounds for export to France. A Gloucester, Mass., plant has bought 5,000 to 10,000 tons of shell steel. Some of the largest lots of shell stock have been going at 2.75c, mill, while the more moderate tonnages continue to command around 3c, mill. Some buying of steel bars for first quarter from regular domestic trade continues to be done at 1.40c, Pittsburgh. This price also now is being asked on current delivery by the Carnegie Steel Co. and other large producers. Bar specifications are active.

### Makers Welcome Cancellations

Philadelphia, Sept. 28. — Makers of steel bars continue to welcome because of the heavy demand and rising market the opportunity to cancel unspecified monthly quotas on contracts, but the buyers are watching closely their tonnages and very few obligations are being avoided in this way. Cancellations for the closing quarter month of September in this district were very light. As matters now stand, some of the mills would rather free themselves of some of their commitments than take on new tonnage. Buyers show a willingness to pay 1.40c, Pittsburgh, for specific lots of steel bars for this year's delivery. Some offers at this figure have been made by buyers in this territory and in one case, these were refused because the maker could not spare the quantity desired. The 1.40c, Pittsburgh, price now appears more general on current orders. Heavy negotiations for shell bars are going forward with makers and sellers in this district. A lot of 50,000 tons of rounds for export is being closed in this district, but some details yet remain to be settled. Another large lot is practically closed. A number of eastern Pennsylvania plants are figuring with the mills for steel with which to engage in the manufacture of shells. One of these matters, now calling for 1,000 to 1,500 tons, eventually may total 20,000 tons. A new lot of 700 tons was offered this week. The Jones & Laughlin Steel Co. is the low bidder on 250 tons of bars for the Panama canal.

### Steel Bars Advanced

Chicago, Sept. 28.—An advance to 1.59c, Chicago mill, on steel bars has been made by the leading interest on material to be delivered during last quarter. The leading independent is sold up for the remainder of the year and is not quoting on any business before Jan. 1. Specifications and new orders are being received in large volume and during the past 10 days domestic business has shown a gratifying increase. Manufacturers of all kinds are entering the market for their requirements and railways are buying much better than formerly all sorts of material.

### Bars Held at 1.40c

Pittsburgh, Sept. 28. — Steel bars, which have reflected strength for several months, have been put up to 1.40c by the Carnegie Steel Co. and other makers in this district. Demand for large rounds for the manufacture of shrapnel and shells is decidedly heavy. An inquiry for 10,000 tons of rounds, submitted makers in this district a fortnight ago, was placed in the east last week. Deliveries of rounds of large diameter are deferred six months, in many instances. Bar iron makers now are asking 1.45c and 1.50c and some material of special analysis has sold at above the latter figure.

### Contracting For First Quarter

Cleveland, Sept. 28.—One of the leading independent companies is contracting for shapes, plates and bars for first quarter at 1.40c, Pittsburgh, and has taken on a large tonnage for that delivery. The Steel Corporation and most of the independents are, however, declining to quote for delivery after Jan. 1. Inquiries for very large tonnages of steel, ranging all the way from 3¼-inch to 14-inch, for shrapnel and high explosive shells are pending. It is believed that owing to the necessity of thoroughly blowing up the trenches, the demand for high explosive shells will be greater than that for shrapnel. Inspections at plants which have established a reputation for doing good work are not very rigid. Shells are being freely accepted and being shipped rapidly to France and England.

*(For complete prices see page 660.)*

# Billet Prices

**For Shipment After Jan. 1 Are Being Given Some**

Philadelphia, Sept. 28.—Eastern makers of billets are nearing the time of naming prices for shipment after Jan. 1, as they have been requested to do so by some buyers. The present indications are that prices will hold closely to those asked for this year's delivery, which on open hearth re-rolling steel were from $28 to $30, mill. A fair run of miscellaneous business in billets and other semi-finished forms is coming up, but eastern Pennsylvania makers have trouble in accommodating it, as little material is available for this year. In some cases, where buyers have insisted strongly, they have been accommodated with some steel. The local locomotive builder bought 900 tons of 6-inch forging billets for this year from an eastern mill. A lot of 500 tons of last quarter re-rolling steel went to an Ohio maker at $26, mill, or about $29 delivered. A Cumberland buyer still figures on a tonnage of sheet bars for next year. Nothing has developed from a recent inquiry for 20,000 to 25,000 tons put out by the American Car & Foundry Co. and by another eastern car builder, which presumably was to cover a prospective munition contract. The Algoma Steel Corporation has ceased to offer semi-finished in eastern territory, as it is understood to be filled on business for the rest of the year.

### Inquiry for Export

New York, Sept. 28.—An inquiry for 5,000 tons of puddled iron blooms for export has appeared in this market. The destination is not given. Italy continues as a prospective purchaser of very large quantities of ingots, billets, rail crop ends and other re-rolling steel stock and probably would take as much as 100,000 tons for early delivery, if this quantity could be obtained. Italian buyers, however, find difficulty in getting makers to accept large orders of this kind in view of the general scarcity of steel. At the present time, 6 to 7-inch rounds especially are wanted, although a lot of 10,000 tons of larger sizes remains unacted upon. Some of the steel foundries have been ap-

proached as to figuring on ingots for Italy and prices have been submitted, but these usually have been higher than the buyers have been willing to pay. On high class re-rolling scrap, notably steel axles, $23, tidewater, recently was paid on 1,000 tons by Italian buyers.

### Tight at Youngstown

Youngstown, O., Sept. 28. — The semi-finished steel situation is tighter than ever, if anything. Practically no open hearth steel is obtainable for this year's delivery. Open hearth sheet bars may be quoted nominally $26, Youngstown, although it is probable a producer could obtain $27, if he had the material to sell. Open hearth billets may be quoted from $25 to $26, Youngstown. Bessemer sheet bars are steady at $25. Some of the leading valley interests recently advanced their minimum price on bessemer billets from $24 to $24.50, Youngstown, and the market now is $24.50 to $25 for this description. Producers, so far as known, have not opened their books for next year, while domestic consumers generally are covered under contract for the last quarter.

### Semi-Finished Scarce

Pittsburgh, Sept. 28.—Because of the infrequency of sales, it is difficult to quote billets and sheet bars accurately. Not much tonnage is being offered in the open market and recent sales have involved material of special analysis for the manufacture of war material. A small tonnage of bessemer sheet bars for prompt delivery was sold last week by a Youngstown maker at $24, mill. Forging billets are commanding $35 a ton and above. Wire rods are held at $30, Pittsburgh, by the American Steel & Wire Co. Wire rods are scarce and are not offered in the open market.

## Chicago Business Brisk

Chicago, Sept. 28.—Chicago warehouses find business continues excellent, slow deliveries on material from mills being responsible for most of the increase. Prices are unchanged, but recent advances on material from mills probably will bring about higher warehouse quotations soon.

William L. Hurd, president of the Monongahela Tube Co., Wilson, Pa., died at his home in Pittsburgh, Sunday, Sept. 26, aged 68 years. About 25 years ago Mr. Hurd was connected with the Lake Shore Tube Co., Cleveland, and later went to Pittsburgh, where he organized the Duquesne Tube Co. He retired from the tube business in 1893, and in 1898 organized the Monongahela Tube Co.

# Plate Mills Are Crowded

## And Prices Are Advancing—Ship Orders an Important Factor in the Market in East and on Lakes

Philadelphia, Sept. 28.—One important eastern Pennsylvania maker of plates has advanced the minimum price at which it will accept orders for this year's delivery to 1.45c, Pittsburgh, or 1.609c, Philadelphia. It is booking both orders for current delivery and fourth quarter contracts on this basis. This maker reports its mill orders recently have been running at fully three times its full capacity and it is practically booked full to Jan. 1. No quotations beyond that date are being made. The Carnegie Steel Co. has advanced to 1.40c, Pittsburgh, for current delivery and leading independent makers in the Pittsburgh district have adopted the same policy. Nevertheless some quotations of 1.35c, Pittsburgh, appeared from certain eastern makers in the week and in some cases, it is claimed lower was done. Such instances, however, are rare. Marine work continues to add to the demand for plates. The Harlan & Hollingsworth Corporation is credited with taking another vessel, a tank steamer to require several thonsand tons of plates. The statement again is made that a Baltimore yard has received two 5,000-ton boats from Norway and many other vessels are in the market. The United States Steel Products Co. is the low bidder at 1.616c, delivered, on 1,355 tons of plates and at 1.608c, delivered, on 250 tons of shapes for the Panama canal. Bids go in tomorrow on about 11,000 tons of plates for stock for the various navy yards, which is a deferred letting.

### Plates Advanced $1

Pittsburgh, Sept. 28.—Under date of Sept. 24, the Carnegie Steel Co. put up its price of plates, shapes and bars $1 per ton and is now quoting all three products at 1.40c for shipment the next three months. Other makers have adopted that figure. Domestic specifications for plates are coming out in good volume and it appears likely, from tentative negotiations opened by leading railroad interests, that railroads soon will cover requirements for the first half of 1916. New York Central lines last week purchased 3,000 freight cars from the American Car & Foundry Co., the Pressed Steel Car Co. and the Standard Steel Car Co. Since the original inquiry was for 1,500 cars, it looks as if rather attractive prices were offered.

### May Be Shortage

Cleveland, Sept. 28.—A shortage of plates in the not far distant future is predicted, for the reason that steel plants connected with plate mills are being offered very attractive prices for semi-finished steel. One plant of this kind was offered $48 per ton for high manganese and high carbon blooms within a few days, but has declined the offer, as it is determined to keep its customers supplied with plates. In addition to the boat taken by the Toledo Ship Building Co., mentioned last week, another boat for service on the Atlantic, requiring about 2,500 tons of plates, has been contracted for, and it is practically assured that four more boats for ocean service will be ordered. There are also rumors of several larger boats for lake service being placed and on the whole the outlook for ship building is greatly improved. Placing of contracts proceeds rather slowly on account of the ship builders having advanced prices so as to make a reasonable profit. The new figures seem high compared with those of the last year or so, which were not much, if any, above cost.

(*For complete prices see page* 660.)

## Pennsylvania Steel Changes

Robert E. Belknap, who has been district sales manager of the Pennsylvania Steel Co. at Chicago, has been made district sales manager at New York City, succeeding R. W. Gillispie, who recently became general manager of sales of the company. R. W. Reed, who has been assistant district sales manager at New York, has been made district sales manager at Steelton, Pa.

Henry C. Shaw, 61 years old, vice president of the A. Garrison Foundry Co., Pittsburgh, died unexpectedly at his home in Sewickley, Pa., Sept. 26. He was born in Pittsburgh. Mr. Shaw was graduated from the Rensallear Polytechnic Institute in 1876 and entered the employ of the Rensallear Iron & Steel Co., Troy, N. Y. Later, he was associated with the Illinois Steel Co. In 1893, Mr. Shaw returned to Pittsburgh to affiliate with the Lewis Foundry & Machine Co. Ten years later he became interested in the Garrison company.

The Massillon Bridge & Structural Co. has taken a contract for 360 tons of steel for the Stillman theater, adjoining the Statler hotel, Cleveland.

# Sheets Advance

**With Exception of Galvanized, Prices Are $2 Per Ton Higher**

Youngstown, O., Sept. 28.—The past few weeks have seen a great change in conditions in the steel sheet market. Domestic demand is showing definite improvement. One interest, of long experience in the sheet trade, says the home demand for black sheets now is the best he has ever seen it. Another company states that the inquiries it has received lately have exceeded by 10 times the capacity of its plant. Blue annealed sheet business is relatively even better.

Box annealed and blue annealed sheet prices have been gaining steadily, partly due to the better home demand, but largely because of increasing costs. Export shipments to South America, Canada, England, France and elsewhere also have given support to the market. Another important factor is the fact that some of the larger sheet producers, manufacturing their own sheet bars have been concentrating their efforts to meet the abnormal demand for semi-finished steel, and neglecting to some extent their sheet business. Thus the sheet mills of some of the larger interests in the valley are operating at around 70 per cent, while all the smaller independents are operating to capacity in their black and blue annealed departments.

Domestic demand for galvanized sheets has been broader and just now specifications against contracts are heavy. The market for galvanized sheets is uncertain, but a range of 3.60c to 3.80c, Pittsburgh basis, for No. 28 gage represents the position of most makers. The recent strength of spelter and the increasing cost of steel foreshadow higher galvanized quotations soon. Blue annealed sheets are firm at 1.60c, Pittsburgh, for No. 10 gage. Black sheets are generally held at 2c, Pittsburgh, for No. 28 gage, although sales at 1.90c still are reported. Some producers are holding open hearth sheets at a premium asking 2.10c for this description. At 2c box annealed sheets are below parity with blue annealed sheets of the same gage.

### Strong at Cincinnati

Cincinnati, Sept. 28. — The sheet market is strong. Galvanized sheets No. 28 gage are holding firmly at from 3.60c to 3.75c, with the higher price prevailing in most instances. Black No. 28 gage are quoted at from 2c to 2.15c, with 2c the more general of the two. Mills are refusing to sell for extended delivery because of the uncertainty of the price of spelter. Rolling mills in this territory are running full in all depart-

### Demand Active

Chicago, Sept. 28. — Demand for black sheets continues active and although quotations on No. 28 gage are 2.14c to 2.19c, Chicago mill, with the maximum prevailing in most instances, it is believed a higher figure will be marked up within a short time. Galvanized sheets continue difficult to obtain and 3.79c, Chicago mill, can be done on No. 28 gage. The leading independent maker continues to remain out of the market.

### Sheet Products Advanced

Pittsburgh, Sept. 28.—Steel sheet products, with the exception of galvanized material, have been advanced $2 a ton above prices prevailing a week ago. No. 10 blue annealed sheets are held at 1.60c and No. 28 gage black sheets are quoted at 2c by the American Sheet & Tin Plate Co., the Youngstown Sheet & Tube Co. and other prominent makers. Galvanized steel sheets have reflected weakness; some mills are offering No. 28 gage at 3.50c. Galvanized sheet departments are operating at about 30 per cent of capacity; if 75 per cent of the galvanized capacity were engaged, sheet mills would be running at about maximum theoretical capacity. Specifications from electrical equipment concerns are decidedly heavy and automobile makers continue to buy large tonnages. Deliveries of blue annealed sheets are deferred several weeks.

### Buyers Inquire Ahead

Philadelphia, Sept. 28. — One of the leading eastern Pennsylvania sheet makers has its tonnage now practically engaged for the year, but as yet, though some inquiry is current, there is no disposition to quote for first quarter. Some further contracts for fourth quarter have been entered into at a range of 1.50c to 1.60c, Pittsburgh, for No. 10 gage blue annealed. For nearby shipment, some additional lots have been sold as high as 1.65c, Pittsburgh. Mill orders are active.

### Tin Plate Quiet

Pittsburgh, Sept. 28.—Apparently believing that tin plate for 1916 shipment will command considerably above the price established for this year's delivery, some buyers are specifying to the full extent of contracts and will stock what material is not required for this year's trade. The general tin plate market is quiet and prices, despite high quotations for raw material, are low.

*(For complete prices see page 660.)*

# Ore Movement

**Is Heavy—Youngstown Company Takes Additional Tonnage**

Cleveland, Sept. 28.—The Youngstown Sheet & Tube Co. has bought 100,000 tons of ore additional to fill out its requirements, which are now estimated at about that tonnage greater than the original estimate. No other important transactions are reported. The movement from the upper lake ports continues heavy in spite of unfavorable weather and it seems probable that the shipments for September will amount to 8,500,000 tons. Ore shippers are hoping that when the grain movement becomes lighter, a little later in the season, there will be more vessel tonnage available for the movement of ore.

### Rushing at Toledo

Toledo, O., Sept. 27.—The ore business in Toledo is rushing. It is stated that more iron ore was received here by lake during the past week than during any similar period for several years past. More than 85,000 tons of ore were received here in less than six days. Very little was received this year from the Canadian side. The rush in ore shipments will probably continue from now on until the close of transportation.

# Wire Advance

**Brings Out Specifications—Inquiry for Barbed Wire Heavy**

Cleveland, Sept. 28.—The recent advance in the price of wire nails and plain wire has had the effect of bringing out very liberal specifications. In other words, no tonnage is being allowed to lapse. Some very large inquiries for barbed wire are pending. Some of these inquiries amounting to as high as 100,000 tons come from very unusual sources and are not taken very seriously by the mills, whose books are already crowded with orders for this kind of wire.

### Wire Mills Busy

Pittsburgh, Sept. 28.—Wire mills are operating at maximum capacity and most of them have enough tonnage on their books to assure continued activity until after Jan. 1. Advanced prices announced a week ago are being quoted by all concerns, but not much new buying has been enjoyed. Domestic specifications for nails and wire show more snap, and foreign interests continue to press manufacturers for additional tonnages of barb wire. Pending inquiries for barb wire for shipment to England involve approximately 100,000 tons, although it

is impossible to determine the extent of duplication.

### Demand for Barbed Wire

Buffalo, Sept. 28.—Inquiry to a considerable extent has developed for galvanized wire for export, but owing to early forwarding dates required interests here were unable to consider the order.

Canadian manufacturers of wire nails, it is reported, are perfecting plans for the installation of plant additions for the manufacture of barbed wire and are in the market for machinery. This move is to cope with the foreign demand for barbed wire.

It is also reported that one of the independent wire drawers is negotiating with capital interests for the purpose of constructing at an early date a blast furnace and rod mill.

## Eastern Scrap Sales

**Were Heavy and Market Not So Active as in Recent Weeks**

Philadelphia, Sept. 28.—As the result of aggregate purchases during the past two or three weeks of approximately 50,000 tons of heavy melting steel at $15, delivered, for shipment in 30 to 60 days, eastern Pennsylvania steelmakers continue to show a reduced interest in new buying. The market reflects this fact by a smaller buying volume not only in this leading grade but sympathetically in other classes of material. The market still shows no signs of real weakness, however. A large short interest has been created by the recent heavy sales of steel and much of this yet is to be satisfied. Brokers consequently are active and are absorbing all the metal they can find to apply upon these contracts. Consumers of grades other than steel are inclined to hold off for a while and to lower their offers. For wrought pipe, $14, delivered, now is the highest tendered. Small sales of borings and turnings at $10.50, eastern Pennsylvania, are noted. Further sales of low phosphorus at $21, delivered, have been made. Steel axles are in good demand for export. Italy recently took 1,000 tons for which it paid about $2 more than the maximum of the present domestic market of $20 to $21, delivered.

### Some Soft Spots

New York, Sept. 28.—Soft spots have continued to appear in some of the mill grades of scrap, since these consumers satisfied their requirements by large tonnages recently taken, and their interest, at present, is at a low ebb. Brokers in covering upon these orders now are furnishing most of the present buying in these grades. Holders of material view the present lull as a natural reaction and not a weakening movement. They, therefore, show small inclination to make concessions, with the result that the trading supply of material is not very liberal. Cast scrap continues in active demand, especially for New England delivery, where the foundries have been buying freely for shipment over the next 60 days. Around $15, delivered, is being paid for heavy cast by the foundries there.

### Heavy Tonnage Moving

Buffalo, Sept. 28.—The aggregate tonnage of all lines sold during the past week in the Buffalo district was heavy, although none of the individual sales was large. The principal movement was in heavy melting steel, bundled sheet scrap and No. 1 busheling scrap. Prices generally remain the same as quoted a week ago with the exception of low phosphors steel scrap and old steel axles. Both were advanced $1 per ton, it being a case of demand against scarcity. Considerable tonnage of machine shop turnings was moved during the week. There seems to be an over production of this commodity at present and prices are inclined to be weaker, but not enough so at this time to change the schedule previously quoted. Borings are in good demand, but show no advance as yet in prices.

### Heavy Melting Steel Declines

Pittsburgh, Sept. 28.—The embargo against the Pittsburgh Steel Co. coupled with threatened similar action against another consumer, whose yards are filled with material have tended to demoralize temporarily the market for heavy melting steel in this district. Dealers have been forced to sell some stock on track at $14 a ton, or about $1 a ton below the prevailing maximum price a fortnight ago. Other grades of old material continue their march toward higher levels, but there is not much snap to new buying. Low phosphorus steel scrap is commanding as high as $20 a ton.

### Scrap Advances

Cincinnati, Sept. 28. — The scrap market has advanced about 50 cents a ton on all steel-making grades. Rolling mills are taking heavy shipments on old contracts, but are not closing new orders. Jobbing foundries are buying low grade iron in preference to scrap iron, because in some cases the former is cheaper and better to handle. Stove foundries continue dull, and stove scrap is weak and in poor demand.

### Scrap Market Quiet

Chicago, Sept. 28.—Scrap in the Chicago market is unusually quiet and practically no activity is discernible. Brokers are buying somewhat to fill former orders, but consumers are taking comparatively little material. An independent steel maker bought some tonnage of heavy melting steel several days ago, but the price did not advance on this buying as had been expected. Most of the tonnage was taken at $12.

Railroads are not furnishing much material, the Rock Island having the only list now current with 4,000 tons. The Illinois Central closed a list of 3,500 tons late last week.

### Light Demand

St. Louis, Sept. 28.—The demand for scrap continues light in this market. While quotations are unchanged generally, dealers who are anxious to sell are making some concessions in prices. A quantity of rolling mill grades, also steel scrap, is moving from this market to eastern mills. Steel axles are going forward for export. Locomotive tires have advanced from $10 to $10.50 to $11.50 to $12. The only railroad offerings on the market are a lot of 1,200 tons by the N. C. & St. L., and 500 tons of solid steel wheels by the Frisco.

(*For complete prices see page* 660.)

## Bolts and Nuts

**Will Probably Be Again Advanced—Rivets Higher Oct. 1**

Cleveland, Sept. 28.—The price of rivets for fourth quarter delivery will be 1.70c for structural and 1.80c for boiler and the present outlook is that these quotations will be maintained without trouble. The demand for bolts and nuts continues active and another advance is expected.

### Nuts and Bolts Strong

Pittsburgh, Sept. 28.—Structural rivets are being held at 1.65c, and boiler rivets at 1.75c, or $1 a ton respectively above minimum prices of a week ago. Nuts and bolts probably will be put up in price this week to meet advances in the price of bar steel and bar iron. Track bolts, which sold at as low as 1.75c six months ago, now are held at 2.10c and above. Railroad spikes of standard size show strength. Some makers are asking 1.60c, but the 1.50c price has not disappeared.

The Republic Iron & Steel Co. is building an addition to its benzol plant at Youngstown, O. Capacity will be doubled.

# Shipment of Shapes

**May Make a New Record This Month—Many Small Jobs**

New York, Sept. 28.—Indications are that some of the eastern Pennsylvania structural mills will break all records in history for shipments during the month of September. Certain of these mills delivered at the highest figure in their experience in August, but the movement in September, it is believed, has surpassed the previous month. Heavy mill shipments continue to mark the situation, even though the tonnage in larger-sized jobs now coming up in this territory offers few exceptions where large tonnages are involved. There is, however, a very heavy flow of business to the mills from small and moderate building contracts. Plain material prices are well established and steady, ranging in this territory from 1.40c to 1.45c, Pittsburgh, or 1.569c, New York, or 1.619c, depending on the size of the order.

### Little Tonnage to Offer

Philadelphia, Sept. 28. — With the closing of some additional contracts for fourth quarter at 1.40c, Pittsburgh, certain eastern shape mills now have only incidental lots they can take on for this year, as specifications remain very liberal. On these pick-up lots for this year, the price named in this territory where the mills, because of their nearby location, can compete against the dealers, is 1.50c, Pittsburgh, and all makers seem to be following the same schedule. In outside districts, however, 1.40c, Pittsburgh, still is being accepted on these orders. None of the eastern mills is naming prices after January.

### Shapes Up $1 a Ton

Pittsburgh, Sept. 28.—As expected for several weeks, the Carnegie Steel Co. and other makers have advanced the price of structural shapes $1 a ton and are now asking 1.40c for delivery to Jan. 1. Specifications for shapes are coming out in rather heavy volume.

### Another Akron Addition

Cleveland, Sept. 28.—The American Bridge Co. has taken a contract for 1,600 tons of structural material for an addition to the plant of the Goodrich Rubber Co., Akron, O., but no other business of importance is in the active stage. Plans for the addition to the Hollenden hotel have not been completed.

### Steady at Chicago

Chicago, Sept. 28. — Demand for structural shapes is on the increase and fabricating shops are receiving numerous inquiries, a great many of which are coming to the point of buying. Structurals have been advanced by the leading interest to 1.59c, Chicago, and this promises to be the prevailing price for the final quarter.

#### CONTRACTS AWARDED.

Armour & Co., oleo and butterine buildings, U. S. Yards, Chicago, 1,517 tons, to Hansell-Elcock.

Fremont avenue bridge over Lake Washington canal, Seattle, Wash., 1,308 tons, to American Bridge Co.

Pennsylvania Railroad Co., coal handling plant, Baltimore, Md., 810 tons, to American Bridge Co.

Moffitt Theater building, Oakland, Cal., 600 tons, to Western Iron Works.

Pacific Mutual Life Insurance Co. building, Los Angeles, Cal., 500 tons, to Llewellyn Iron Works.

St. Joseph Hospital, Kansas City, Mo., 348 tons, to Kansas City Structural Steel Co.

Security National Bank building, Sioux Falls, S. Dakota, 324 tons, to Minneapolis Steel & Machinery Co.

Inspiration Consolidated Copper Co., train shed, pump house, and settling tanks for plant at Miami, Arizona, 260 tons.

Thirtieth street pier, Brooklyn, 1,000 tons, to the American Bridge Co.

M. F. Cahill building, South Boston, 200 tons, to the Boston Bridge Co.

Subway station, Long Island City, for the Interborough Rapid Transit Co., 200 tons, to Levering & Gerrigues.

First squadron armory, Philadelphia, 600 tons, general contract awarded to Fidelity Construction Co.

Buildings for State Hospital, Farview, Pa., 200 tons, to the McClintic-Marshall Co.

Finck Publishing loft, West Thirty-ninth street, New York City, 2,200 tons, steel work formally awarded to the American Bridge Co. by Post & McCord, the erectors, as indicated last week.

Buildings for the State Industrial Home for Women, Muncy, Pa., 300 tons, to the American Bridge Co.

Caxton printing building, West Twenty-eighth street, New York City, 1,575 tons, to the Harris-Silvers-Baker Co.

Westchester county courthouse, White Plains, N. Y., 600 tons, to the W. B. Shafer Co.

Warehouse for the Kirkman Soap Co., Brooklyn, 550 tons, to the Empire Structural Steel Co.

Buildings for Jamestown Railway Co., Jamestown, N. Y., 300 tons, awarded to the Kellog Structural Steel Co.

Storehouse, P. & L. E. R. R., Pittsburgh, 150 tons of sheet piling to Lackawanna Steel Co.

#### CONTRACTS PENDING.

Bridge for Philadelphia & Reading railroad, Sunbury, Pa., 3,000 to 3,500 tons, bids being taken.

Draw bridges for the Pennsylvania railroad, 200 tons, bids being taken.

Sugar mill, Cuba, 1,000 tons, bids being taken.

Marine barracks, Norfolk, Va., 500 tons, bids entered.

Buildings for Johns - Hopkins University, Baltimore, 700 tons, bids being taken.

Hudson county jail, Jersey City, N. J., 1,600 tons, revised bids to be taken Oct. 3.

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Schellenbach-Hunt Tool Co., Cincinnati, has leased the seventh floor of the Murdock building for ten years. This space will be used for offices.

*(For complete prices see page 660.)*

# Railroad Buying

**Is Much More Active—Orders for Cars and Rails**

New York, Sept. 28.—An active week in equipment buying by the railroads has brought encouragement to car and locomotive builders.

Car orders of the week totaled 5,000 to 6,000. The New York Central placed 1,000 gondolas each with the Pressed Steel Car Co. and the Standard Steel Car Co., for the Pittsburgh & Lake Erie, 1,000 box with the American Car & Foundry Co. and 500 box with the Barney & Smith Car Co. for the Cincinnati Northern. The Wheeling & Lake Erie closed for 750 gondolas with the Standard Steel Car Co. and for 200 steel automobile cars with the Western Steel Car & Foundry Co. The Chicago & North-Western bought 500 ore cars of the American Car & Foundry Co. Other orders include 50 tank cars for the Emlenton Refining Co. and 100 gondolas for the Campbell's Creek Coal Co., to the American Car & Foundry Co.; 75 tank cars for the American Steel & Wire Co., to the German-American Car Co.; five billet cars for the Carnegie Steel Co. to the Youngstown Car & Mfg. Co., 30 steel coaches for the Central of New Jersey to the Harlan & Hollingsworth Corporation. The Baltimore & Ohio placed the repairs of 500 cars with the Ryan Car Co. and of 250 to 300 with the Western Steel Car & Foundry Co. Pending car inquiries run 5,000 to 6,000. New lots out include 1,000 hoppers for the Reading and 1,000 hoppers for the Western Maryland.

In locomotives, the Baldwin Locomotive Works has taken 20 from the Reading and 10 from the Atlantic Coast Line. The American Locomotive Co. received three for the Punta Alegra Sugar Co., of Cuba, and one for the Cupey Sugar Co., of Cuba.

Rail buying proceeds quite briskly. The New York Central lines now announce officially the distribution of their 1916 rail order, totaling 120,000 tons. The Steel Corporation received about 55,000 tons for the lines west, the Lackawanna Steel Co. about the same tonnage principally for eastern lines, and the Cambria Steel Co. took a small portion. In addition, 10,000 to 12,000 tons are to be placed with the Corporation mills later for the Pittsburgh & Lake Erie. The Burlington has bought 15,000 to 20,000 tons from the Illinois Steel Co. The Erie has closed for 10,000 to 15,000 tons with eastern mills, in addition to 20,000 tons announced last week for the Illinois Steel Co. The Seaboard Air Line is said to have bought rails.

# MEN OF THE IRON TRADE

**Who they are** **Where they are** **What they are doing**

William T. Snyder, who was elected president of the Association of Iron and Steel Electrical Engineers at the Detroit convention recently, has been in charge of the electrical department of the McKeesport plant of the National Tube Co., Pittsburgh, for six years. He has been with the National company since 1898. Mr. Snyder was secretary of the association for two years. He is a member of the American Institute of Electrical Engineers, the Engineers' Society of Western Pennsylvania and the Sons of Jove. Mr. Snyder was born at Alpsville, Allegheny county, Pa., Feb. 20, 1880.

W. O. Oschmann, who succeeds Mr. Snyder as secretary of the association, was born in Pittsburgh in 1884. He is a graduate of the Carnegie Institute of Technology. Mr. Oschmann obtained his early practical training with the Monongahela Light Co. at Rankin. He resigned his position as assistant electrical engineer at the Rankin plant in 1913 to become superintendent of power for the Oliver Iron & Steel Co., Pittsburgh, with which he since has been identified.

George A. Turnville, treasurer of the Crucible Steel Co. of America, has been made secretary of the company.

W. P. Snyder, president of the Shenango Furnace Co., Pittsburgh, is attending the exposition at San Francisco.

F. Lee Norton, vice president and general manager of the J. I. Case Threshing Machine Co., Racine, has resigned his position and will take a long rest before resuming activity.

George M. Rider, formerly engaged in the iron and steel brokerage business in Kansas City, Mo., is now in charge of the Kansas City office of A. M. Castle & Co., Chicago.

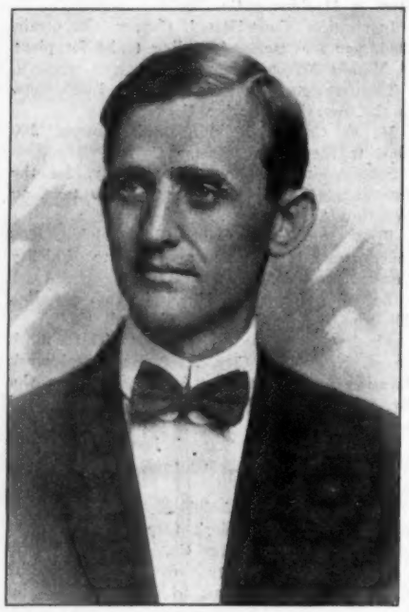
Paul F. Schryer, of the Rayleigh-Schryer Co., Freeport, Ill., has been made works manager of the Milwaukee plant of the International Harvester Co. at Milwaukee.

Charles G. Smith has resigned as manager for the receiver of the Pittsburgh Emery Wheel Co., Pittsburgh, and has become affiliated with the Abrasive Materials Co., Philadelphia, in the capacity of grinding engineer.

Robert S. Armstrong, chief engineer of the Brooklyn plant of the American Bridge Co., has been appointed New York contracting manager for Milliken Bros., Inc., Staten Island, N. Y., effective Oct. 1.

T. W. Weaver, formerly director of purchases for the Power & Mining Machinery Co., Cudahy, Wis., has become associated with L. E. Meidinger in the management of the Milwaukee office of A. M. Castle & Co., of Chicago.

W. E. Hardy, for the past 11 years connected with the Diamond Rubber Co., and the B. F. Goodrich Co., and lately in charge of the sales of the



W. T. SNYDER

mechanical rubber goods division, has lately been appointed sales manager of the Boston Belting Co., Boston, manufacturer of mechanical rubber goods.

Edward R. Stettinus, who has been with J. P. Morgan & Co. as general purchasing agent in this country for the entente powers, has resigned as president of the Diamond Match Co., a position he long has held. When he first took up his purchasing office with J. P. Morgan & Co. he received a leave of absence from the Diamond Match Co.

C. Arn Groen, representing the Spliethoff, Beeuwkes & Co., engineering agents and agents for machinery, Rotterdam, Holland, was in Worcester, Mass., last week and placed orders with machine tool manufacturers for machinery to be sent to Holland. He will also visit manufacturers in Chicago and the middle west before returning home.

F. E. Woodford, president Woodford Engineering Co., Chicago, read a paper on "Centrally Controlled Electric Haulage Systems", Sept. 21, before the Engineers' Society of Western Pennsylvania, Pittsburgh. Mr. Woodford discussed causes leading to the development of centrally controlled haulage and told of numerous accomplishments of central control.

Foster Milliken, formerly president of Milliken Bros., Inc., Staten Island, N. Y., iron and steel fabricators, has been elected president of the McNab & Harlin Mfg. Co., Paterson, N. J. This company has been engaged during the past 60 years in the manufacture of brass, iron and steel valves, cocks and fittings for steam, water and gas. Its main office is at 55 John street, New York City.

W. G. Underwood has been appointed sales manager of the St. Louis office of Domhoff & Joyce, to succeed George K. Connelly. Mr. Underwood is a native of Cincinnati, and was connected with Domhoff & Joyce in that city four years before coming to St. Louis. He has had 18 years experience in the iron business. Mr. Donnelly will return to the Cincinnati office, where he was connected before going to St. Louis.

R. T. McCormick, manager of sales of the Knox Pressed & Welded Steel Co., Pittsburgh, has resigned to become secretary and sales manager of McAleenan Bros. Co., Pittsburgh. Mr. McCormick for 12 years, was sales engineer for the Riter-Conley Mfg. Co., Pittsburgh, and held a similar position for ten years with the Petroleum Iron Works Co., Sharon, Pa. McAleenan Bros. recently have remodeled their plate shop.

On the occasion of the 50th birthday of U. G. Orendorff, secretary and treasurer of the Parlin & Orendorff Co., Canton, Ill., recently, a handsomely bound book was presented him by workers in the plant. It contained congratulations over the signature of 145 employes who have been connected with the company for 20 years or more. Among the employes are some who have been with the company 52 years.

# Iron and Money: Fact and Comment

## Leading Railroad Stocks Prominent in the Upward Movement—

## Much Gossip About Steel Merger

Rumors of a great combination of steel companies extending from the Atlantic coast to the great divide, in Colorado, had a part in the news of the week. The facts as to the new combination are related elsewhere as fully as can be ascertained. Substantial progress was made during the week toward the arrangement of a large credit or loan for England and France. A prominent feature of the week was the increased strength of railroad shares. General Motors was the sensational performer.

At the opening session Monday considerable excitement developed in motor stocks. General Motors gained 8 points, Willys-Overland, 17 and Studebaker, 10¾. These advances were inspired largely by the 50 per cent dividend on General Motors and the very large earnings reported by that company. Great Northern Ore and Colorado Fuel declined after their sharp advances of the preceding week. The Colorado company's statement of a deficit for the year ended June 30 had some effect.

Tuesday, General Motors advanced 54 points, from 296 to 350, an achievement which surpassed anything that has been accomplished even by the so-called war stocks. The extreme gain was not held, but the stock closed with a net gain of 27 points for the day. Baltimore & Ohio declined in spite of an excellent showing of earnings for August and July. This company, as well as the Pennsylvania company, has every freight car on its system in service.

Westinghouse was a favorite Wednesday, as the directors confirmed the added increase in dividend to a 6 per cent annual basis and admitted that the company's war orders totaled $60,000,000 in gross value. Westinghouse closed, however, with a net loss of over 2 points for the day. Baldwin, Bethlehem, Locomotive and American Car & Foundry scored advances. Steel common advanced to 78¾, a new high point for the year, and closed only ¼ under that figure.

There was some reaction Thursday, and Bethlehem closed 5 points off, but, for the most part, declines were slight. There was considerable talk of the steel merger and Philadelphia newspapers contributed their share to the gossip. Definite information was, however, lacking.

Railroad stocks manifested considerable life Friday. Advances were noted in New York Central, St. Paul, Canadian Pacific and other lines, although the showing was not uniform. There was lively dealing in United States Steel with reports that the fourth quarter earnings would be tremendous. There was more wild talk in regard to steel mergers. In the short session Saturday, buying of railroad shares on rising prices was a prominent feature. The Pennsylvania, Illinois Central and New York Central made substantial advances. Announcement of substantial progress in arranging the Anglo-French credit was believed to have had considerable effect on the market.

Quotations at the close of business Sept. 25, and changes in the leading stocks identified with the iron and steel industry for the week are shown in the following table:

| | Close Sept. 25. | Net chg. |
|---|---|---|
| American Can | 62 | +1¾ |
| American Can, prfd. | 107½ | +2⅝ |
| Amer. Car & Fdy. Co. | 75½ | +4½ |
| Amer. Car & Fdy. Co., prfd. | 117 | +2¼ |
| American Locomotive | 61⅛ | +4¼ |
| American Locomotive, prfd. | 98 | + ¼ |
| American Steel Foundries | 54⅝ | —1⅛ |
| Baldwin Locomotive | 95¼ | +15⅛ |
| Baldwin Locomotive, prfd. | 107½ | +1⅛ |
| Bethlehem Steel | 356 | +12 |
| Bethlehem Steel, prfd. | 170 | +10 |
| Colorado Fuel & Iron | 55¼ | — ¾ |
| Continental Can | 90½ | +3½ |
| Continental Can, prfd. | 106 | +1¼ |
| Crucible Steel | 95¾ | +2 |
| Crucible Steel, prfd. | 108¼ | +2¼ |
| General Electric | 174 | +2⅛ |
| International Harv. of N. J. | 107 | ..... |
| Internat'l Harv. of N. J., prfd. | 117 | +1½ |
| International Harv. Corp. | 69½ | — ½ |
| Lackawanna Steel | 79 | +9½ |
| Nat'l Enamel'g & Stamp. Co. | 28¼ | +1¼ |
| Nat'l En. & Stp. Co., prfd. | 89 | ..... |
| Pressed Steel Car | 64½ | +2½ |
| Pressed Steel Car, prfd. | 101 | +2½ |
| Pullman Palace Car | 159¾ | — ½ |
| Republic Iron & Steel | 47 | +1⅛ |
| Republic Iron & Steel, prfd. | 101⅛ | +1⅛ |
| U. S. Cast Iron Pipe & Fdy. | 20 | —2¾ |
| United States Steel | 78⅛ | +2⅛ |
| United States Steel, prfd. | 114¼ | + ½ |
| Westinghouse Mfg. | 121¼ | +2⅞ |

The following table shows changes in maximum quotations of stocks not listed on the New York stock exchange:

| | | |
|---|---|---|
| American Radiator | 360 | .. |
| American Ship Building | 38½ | 37 |
| Cambria Steel | 65 | 66 |
| Chicago Pneumatic Tool | 86 | 90 |
| Inland Steel | 245 | .. |
| LaBelle Iron Works | 40⅝ | 41½ |
| Lake Superior Corporation | 12 | 10⅛ |
| Pensylvania Steel, prfd. | 84 | 88½ |
| Stewart-Warner Speed Co. | 67 | 75 |
| Warwick Iron & Steel Co. | 10⅛ | 10¼ |
| Westinghouse Air Brake | 141½ | 144 |
| Westinghouse Elec. & Mfg. Co. | 58½ | 62 |

# Midvale Steel Co. Acquired

## By Wm. E. Corey and Associates—Many Rumors of Consolidations Are Not Confirmed

Only one transfer of ownership in important eastern works and other industrial companies yet can be stated positively as the result of a crop of rumors of impending large negotiations which have aroused general discussion and greatly stirred the security markets during the past week.

Proprietorship of the Midvale Steel Co., Philadelphia, has passed to new parties headed by Wm. Ellis Corey, formerly president of the Unted States Steel Corporation, as the result of negotiations carried on by Wm. A. Read & Co., New York bankers, referred to previously. Mr. Corey is associated in this enterprise with Percy Rockefeller, son of Wm. Rockefeller, Samuel F. Pryor, E. C. Converse, former president of the National Tube Co. and at present a director of the Steel Corporation, and others. At a meeting in Philadelphia on Monday, Mr. Corey was elected president of the reorganized company and Wm. P. Barba of the old company, vice president. The directors named include Messrs. Corey, Rockefeller, Pryor and Barba and Howard Sellers and Jas. F. Sullivan, of the old company, the latter having been vice president. Chas. J. Harrah, formerly president and director and the dominant factor in the former Midvale company, has severed all connections with the business.

Mr. Corey returns to active connection with the steel industry after a period of several years. He resigned as president of the Steel Corporation in January, 1911, being succeeded by Jas. A. Farrell, and as a director of the Corporation in 1913. His business career since that time largely has been identified with copper enterprises. Mr. Corey, by reason of his many years of experience in high places in the steel industry, is regarded as an executive and practical manufacturer of the highest ability. Important additions to the capacity of the Midvale plant at Nicetown are expected as the result of the new management. While the works are equipped

NOTED ENGINEERS FROM ALL QUARTERS OF THE GLOBE

The Delegates Who Participated in the Proceedings of the Engineering Congress, Included Many of the Most Noted Leaders in the Engineering The Large Attendance, Coupled With the Unusual Number and Merit of the Papers Presented, Make the Congress a

especially for the manufacture of munitions and, in fact, for years have carried this on as a regular line, the former administration has not been willing to accept munition contracts from foreign belligerents, athough it has been manufacturing large quantities of such material for the United States government. The works under the new management will engage in the filling of orders for the entente powers and extensive enlargements to its capacity are looked for. The present Midvale Steel Co. was incorporated in 1881 and has a capital of $9,750,000. It is currently reported that the new owners paid about $18,000,000 for the business.

The purchase of the Midvale Steel Co. has been associated with rumors of negotiations for change for control in other steel companies and which again have brought into view that familiar figment of popular imagination, a far-reaching merger of independent steel companies. To date, however, absolutely nothing has developed which would tend to show that these reports are grounded in facts. It is understood, generally, however, that the Cambria Steel Co. and the Pennsylvania Steel Co. are involved in negotiations which promise to change their present status, but it is not yet clear what form this will take. Leading officials of the companies decline to throw any light upon the situation. The popular belief is that options given by the Pennsylvania railroad on its stock holdings in both companies to W. H. Donner, president of the Cambria and chairman of the Pennsylvania Steel companies, and associates, have been, or are about to be exercised and that this control may lead to other changes. The name of Chas. M. Schwab, of the Bethlehem Steel Co., has been brought into the reports by reason of his having had conferences the past week at Philadelphia with Mr. Donner. Mr. Schwab has denied that he has had anything to do with the Midvale Steel transaction or with a reported change in control in the Baldwin Locomotive Works, Philadelphia. Mr. Corey, in turn, has declared that he is not interested in any of the Cambria Steel negotiations. The belief is held in well-informed circles that the Midvale Steel Co. purchase is a distinct proposition and has no connection with any possible changes in the Cambria, Pennsylvania or other steel companies. Mr. Pryor, one of the new directors of the Midvale Steel Co., is a director of the Remington Arms Co. and of the General Motors Co. Pierre and Alfred Dupont, powder manufacturers, who are credited with obtaining recently a large amount of stock of the Baldwin Locomotive Works, are interested in General Motors.

# Foundrymen Open Meeting

## A. F. A. Holds First Sessions at Atlantic City—Report on Industrial Education Attracts Interest

Atlantic City, N. J., Sept. 28. (By wire.)—The report of the committee on industrial education was the feature of the joint opening session of the American Foundrymen's Association and the American Institute of Metals, held at Million Dollar pier Tuesday morning. Frank M. Leavitt, chairman, spoke extemporaneously and emphasized the need for closer co-operation between business men and school boards in order that suitable industrial training may be provided in public schools for those in the humbler walks of life as well as for the leaders. The report was discussed by Major Speer, J. S. Seaman and Richard Moldenke and by Benjamin D. Fuller, of the Westinghouse Electric & Mfg. Co., Cleveland.

The attendance was large and the big convention hall in the pier was crowded for the opening session. The hall was beautifully decorated with American flags.

In his address of welcome, Henry A. Carpenter of the General Fire Extinguisher Co., Providence, R. I., predicted unusual prosperity in the foundry trades during 1916. Mr. Carpenter is chairman of the local committee. J. P. Pero, superintendent of the Missouri Malleable Iron Co., East St. Louis, Ill., responded to the welcoming address. He traced the growth of the association and paid tribute to the trade papers for their share in promoting the progress of the foundry business.

At the suggestion of Major Speer, a committee was appointed to draw up resolutions on the death of Thomas D. West. The committee includes Richard Moldenke, chairman, Thomas Devlin, Philadelphia and Paul Kreuzpointer, Altoona, Pa. The safety committee in its report suggested that the association issue a special bullelin covering foundry safety standards in memory of Mr. West. The balance of the day's proceedings included the presentation and discussion of the first of the many interesting papers which had been prepared for the convention.

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The Waters Hinge Co., Galesburg, Ill., has increased its capital from $10,000 to $30,000.

ATTEND MEETING OF INTERNATIONAL ENGINEERING CONGRESS

Field. The Cosmopolitan Character of the Congress is Shown Clearly by the Large Number of Foreign Delegates in the Above Illustration. Notable One. A Full Report of the Sessions Devoted to the Iron and Steel Industry Will be Found on Pages 645-646.

# Foreign Trade

**After the War Discussed by Members of National Council**

A more entrenched position for the foreign trade of the United States after the present European war, especially as it shall be affected by reciprocal tariffs and international commercial agreements, came up for important discussion at the second annual meeting of the National Foreign Trade Council, held at the Hotel Biltmore, New York City, last week, and attended by 35 prominent leaders in the manufacturing and export circles. President Wilson formally was petitioned to use the authority delegated under the present act to negotiate commercial agreements which will insure American shippers reciprocal and equivalent tariff treatment from foreign countries in return for the market in this country open to alien products. It is stated that existing foreign tariffs impede the full development of the export trade of the United States and that the position of this country in this respect may be made unfavorable by trade agreements likely to be made among European nations following the war.

The council adopted a resolution for the appointment by the chairman of a commission of seven to include at least five active business men and one tariff expert, who shall investigate and report to the council "upon the efficiency of the present United States tariff system for the promotion and protection of export trade from undue discrimination by foreign governments".

President James A. Farrell, of the United States Steel Corporation, presided at the meeting. He said European competition will be stronger than ever following the war because of the possibility of economic alliances among the several foreign countries. The merchant marine committee reported that the public's lack of knowledge of the fundamentals of marine transportation was an obstacle to the adoption of a sound policy for encouraging the upbuilding of American shipping. The committee presented a monograph setting forth in simple language the basic facts bearing up this question which is to be circulated widely. The chairman announced that a fund of $1,500 had been established by a member to be distributed in prizes among college students for the best essays on shipping questions. John D. Ryan, president of the Anaconda Copper Co., presented a report on co-operation in foreign trade and W. D. Simmons, of the Simmons Hardware Co., St. Louis, a report on the difficulty of getting desirable men for over-sea trade.

## Working on Memphis Bridge

Work on the erection of the steelwork for the big bridge at Memphis, Tenn., across the Mississippi river, is now being rushed by the fabricators and erectors, the Pennsylvania Steel Co., of Steelton, Pa., after having been practically tied up for more than three months on account of high water.

A large number of men are now employed on this work and it is estimated that 300 or 400 additional structural ironworkers will be required to complete it on time. This bridge is 2,547 feet in length and will weigh approximately 17,000 tons.

**Foundry Addition.**—An addition, 100 x 160 feet, to the main foundry building of the Dominion Steel Foundry Co., Ltd., Hamilton, Ont., is nearing completion. The company has installed in this addition one 25-ton acid open-hearth furnace and one 30-ton Shaw electric 4-motor crane. The Dominion company has also installed a complete outfit for machining 3-inch British shrapnel shells and a set of machinery for finishing 4.5 Howitzer shells.

## Installing Bar Mill

The Simonds Mfg. Co., manufacturer of saws and knives, is installing at its steel mill at Lockport, N. Y., a bar mill which will consist of one train of 16-inch rolls and one train of 10-inch rolls, both motor-driven. The new buildings necessary for this mill will be identical with the present plant, of steel—that is, steel frame, galvanized siding, saw tooth tile roofs. The motor equipment will be on the same lines that has proven successful in the sheet mills of this plant and will include automatic controls, etc. As is the case with the sheet mills, the product of this mill will be largely used by the Simonds Mfg. Co. at its various factories, but there doubtless will be a certain tonnage of strictly high grade output to be disposed of. Contracts have been let and it is hoped to have this mill in operation by Dec. 15.

## Contract for Shovels

St. Louis, Sept. 28.—The Beall Bros. Mining Tool Co., Alton, Ill., has taken a contract from an eastern concern for 100,000 dozen shovels. It is believed that the shovels ultimately will be used for digging trenches in Poland or on the French-British battle front. The capacity of the plant is 500 dozen shovels a day. The plant is busy with large domestic orders in addition to the one from abroad, and double shifts will be worked.

# Spelter Prices

**Are Strong—New War Contracts Are Expected Soon**

New York, Sept. 27.—The undertone in the metal markets has improved considerably during the week closing today. A better demand both from domestic and foreign consumers and the likelihood that there probably will be further buying of metals on account of new war contracts which are expected to be placed here, are responsible in large part for the betterment. At the same time, a factor which is helping along greatly is the expectation that the negotiations which now are under way between American and French and English bankers for the taking up of the $500,000,000 loan to the allies, shortly will be pushed to a successful conclusion.

All grades of spelter continue exceedingly scarce for spot and nearby shipment, as a result of which condition the market continues to reflect an exceedingly strong tone. Prices are tending upward. On prime western the market at St. Louis now is quoted at 14.25c to 14.50c, for spot and September shipment, 14c to 14.25c for October, 13.50c to 14c for November, 13c to 13.50c for December, 12c to 12.50c for the first quarter of next year, and 11c to 11.50c for first half. Brass special spelter is hard to quote, but prompt shipment is unobtainable at anything less than 16c to 16.50c, St. Louis. Brass special has been sold at 13c to 14c, St. Louis, for first quarter and at 12c to 13c, St. Louis, for first half.

Copper demand is better both from domestic and foreign consumers, but the situation is far from being an active one. While the market is firm, some producers admit that production is in excess of consumption and, therefore, unless demand greatly increases, they are not inclined to expect much higher prices. The market now is quoted at 18c, delivered 30 days, for electrolytic; 17.75c, delivered 30 days, for the best brands of casting copper; 16.75c to 17c, cash, for ordinary casting copper; 18.50c, cash, for the best brands of lake copper; 17.75c to 17.87½c, cash, for ordinary lake copper, and 17.62½c to 17.75c for arsenical lake.

Lead producers state that they booked a good-sized business last week, and the demand is keeping up well. There are some good inquiries in the market from foreign consumers. Some of the independent producers are expecting an advance in the American Smelting & Refining Co.'s price, which continues 4.50c, New York. The outside market is quoted at 4.50c to 4.60c, New York, and 4.40c to 4.50c, St. Louis. Sellers are naming higher prices for export than for domestic account. The export prices range from 4.55c to 4.60c, New York.

The tin market is advancing in accordance with developments in London. Importers quote all positions, including spot, at 33.37½c.

# Cast Iron Pipe

**Not in Active Demand, But Order Books Are Well Filled**

New York, Sept. 28.—A continuation of the present activity in the iron and steel market, makers expect, may bring out at earlier dates than usual inquiries from municipalities for cast iron pipe for spring delivery. No signs of such buying, however, yet are presented. The present market is not active but it holds its position well, as the shops have good bookings for several months ahead. Export inquiries still develop slowly. Jersey City is about to inquire for 2,000 tons of 48-inch pipe. Coatesville, Pa., will receive bids Oct. 7 on 400 tons of 6's, 8's and 10's. The United States Cast Iron Pipe & Foundry Co. has taken 500 tons for Panama canal delivery.

# Rail Bookings

**Are Making Good Tonnages—Two More Tank Boats**

New York, Sept. 28. (By wire.)—The Steel Corporation to date has booked 130,000 tons of rails for first half shipment. Independent mills are doing proportionately as well. The Reading buys 103,000 tons from eastern mills, increasing its recent order to 150,000 tons. The Chicago & North-Western has closed with the Illinois Steel Co., but the tonnage is not yet announced. The Western Maryland and Texas & Pacific have bought 1,000 tons each from the Corporation for early delivery.

One estimate in high quarters places the pending cars at 18,000.

The Texas Oil Co. has ordered two more tank boats from the Fore River Shipbuilding Co., requiring 10,000 to 12,000 tons of steel.

# New Cards Issued

Pittsburgh, Sept. 29. (By wire.)—National Tube Co. sent out cards today on oil country goods, dated Oct. 1. With a few exceptions, the cards are the same as those previously offered, but by waiving a special discount, prices of oil country goods have been advanced.

*(For complete prices see page 660.)*

# Several Millions

**Will be Expended by Steel Corporation on Plant Extensions**

New York, Sept. 29. (By wire.)—The Steel Corporation is going ahead with its extensive program of enlargements of finishing capacity and the improvement of mercantile facilities in the general aim toward lower costs. Important work authorized and now proceeding as part of this program includes doubling the capacity of the Schoen Steel Car Wheel Works, McKees Rocks, to cost $1,000,000, and additions to the seamless tube output of the Shelby plant at Elwood City involving an expenditure of $2,000,000, the installation of a 1,000-ton mixer at Homestead and other smaller extensions.

Despite heavier bookings, no large increase in Corporation September tonnage is looked for because of active shipments. The Corporation's operations continue at approximate ingot capacity.

# Bids Opened

**By Navy Department on Large Tonnage—The Low Bidders**

Washington, Sept. 29. (By wire.)—At the opening yesterday by the bureau of supplies and accounts, navy department, of bids involving approximately 18,000 tons of plates, shapes, rounds and rivet rounds, deferred from last week, the lowest bidders, grade of material and figures submitted follow, delivery in all cases to be at navy yards throughout country:

Worth Bros. Co., 300 tons seven to ten-pound plates, 1.65c to 1.72c per pound; 8,000 tons ten to 70-pound plates, 1.59c to 1.65c; 500 tons high tensile plates ten to 60-pounds at 2.40c to 2.49c. Total this company 11,500 tons.

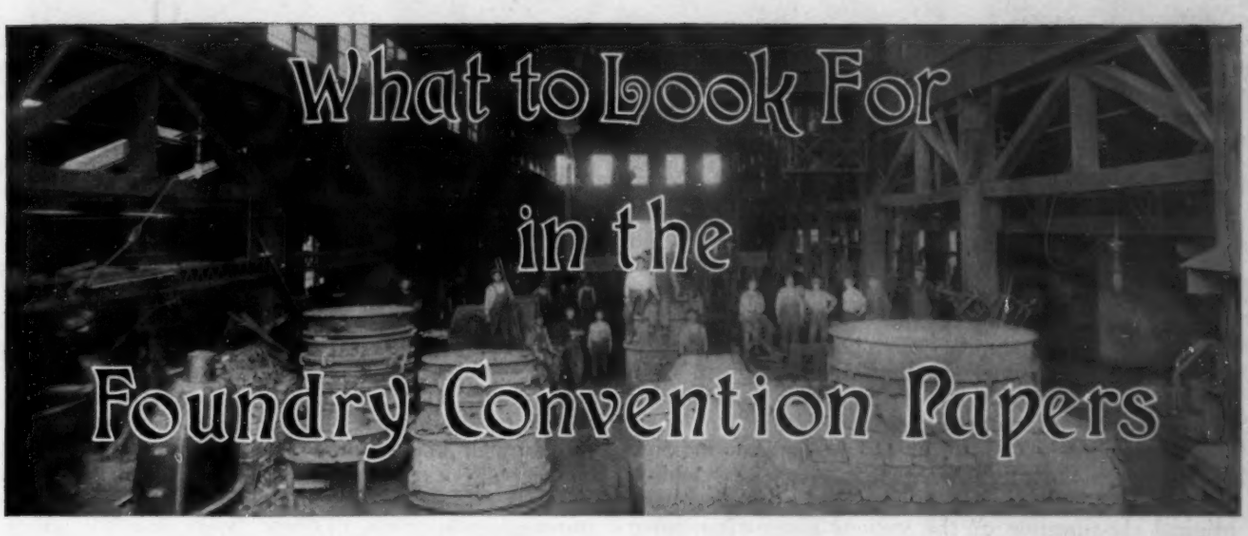
J. B. Kendall Co., Washington, agent Jones & Laughlin Steel Co., 800 tons ten-pound plates, 1.60c to 1.72c; 2,000 tons angles, 3 to 8 inch, 1.60c to 1.72c; 500 tons of channels, 4 to 12-inch, 1.60c to 2.05c.

Alan Wood Iron & Steel Co., 190 tons plates, nine to 12.5-inches, 2.35c.

Carnegie Steel Co., 500 tons rounds at 1⅝ to 11 inches, 1.60c to 1.72c; 1,000 tons rivet rods at one-fourth to 1½ inches, 1.65c to 1.77c.

The deliveries are all deferred, those for plates varying from 90 to 120 days and for shapes from 150 to 180 days.

**Receives Large Order.**—The Allegheny Steel Co., Brackenridge, Pa., is reported to have received a large order for war material, which will necessitate the installation of some new equipment.




AT THE annual meetings of the American Foundrymen's Association and the American Institute of Metals, now concluding their sessions at Atlantic City, N. J., an aggregate of 64 papers and reports were presented. This vast amount of material, approaching a thousand pages of ordinary book matter, contains innumerable suggestions and a veritable mine of information of vital interest to everyone connected in any way with the art, science or business of casting metals. Some of these papers and reports appear on the immediately succeeding pages of this issue of *The Iron Trade Review* and others will follow in subsequent issues. The amount of material involved, however, is so great that few individuals have sufficient time at their disposal to go through it thoroughly. It is necessary, therefore, to adopt some method of selection and elimination and it is with the hope of aiding in this task that this introduction is offered.

What follows is not in the nature of a critical review, but rather a rough chart or guide to the unusually interesting contents of the numerous papers and reports presented at the Atlantic City convention.

At the outset, attention should be called to the unusually large number of committee reports presented at the proceedings of the American Foundrymen's Association. Nine reports were submitted, dealing with a variety of important subjects including safety, specifications for foundry scrap, costs, standard methods of analyzing coke, specifications for gray iron, steel and malleable castings and steel foundry standards. These reports, representing the collective efforts of a large number of practical foundrymen, contain a great deal of first hand information of unusual value. Of particular interest to steel foundrymen is the partial report of the committee on steel foundry standards, presented by R. A. Bull, supervisor of basic atomization tests. This report covers the results of an exhaustive investigation to determine the relative advantages and disadvantages of atomizing fuel oil with steam and air in open hearth steel furnaces. It is a subject with which practically every open hearth steel foundryman is concerned. The investigation indicated that no relation can be drawn between the results with either superheated steam or compressed air as to the quality of the metal produced, time required for making the heat, oil consumption, or temperature secured; although the oxidation losses in the two groups of heats did not vary greatly, the advantage is in favor of steam treated heats. It also is stated that since the cost of delivering the required amount of air invariably would be higher than that entailed by the delivery of a suitable amount of superheated steam, there would seem to be a considerable commercial advantage in employing steam as an atomizing agent in basic open hearth practice, with no loss in the quality of the product.

Parallel to the steel foundry report in importance is that of the A. F. A. cost committee recommending a uniform basis of figuring costs by foundrymen. The uniform cost system which is thoroughly explained, is based on the following assumptions:

1.—The commodity sold by foundries is the labor of the molder and core maker and not the material entering into the product.

2.—The cost of material is more or less constant, varying with market conditions.

3.—The cost of production fluctuates in proportion to pounds of output per molder.

4.—Overhead charges increase or decrease according to pounds of output per molder.

The plan recommended is known as the tonnage-per-day-per-man-plan.

All foundrymen interested in placing the business with which they are connected on a permanent foundation are aware of the importance of a proper system of industrial education. The report of the A. F. A. committee on industrial education, signed by Frank M. Leavitt, chairman, University of Chicago, contains a clean cut analysis of the problems of industrial education in the United States and also presents the results of an investigation into the attitude of foundrymen toward this important subject. In concluding the report, the situation with reference to industrial education is summed up in five brief statements. Industrial education is defined as education for the industrial worker; it is the privilege of practical foundrymen to make a demand upon the schools for co-operation in producing the kind of men needed; it is the duty of foundrymen to co-operate with the schools by giving advice and information regarding the organization of classes and the subject matter of the courses, and if industrial education does not make the employes more efficient, it is not wanted; but if it does, the employer will reap at least some of the benefit and, therefore, should be willing to share in its support.

Several of the committees on standard specifications co-operated with similar committees from the American Society for Testing Materials with the

result that a number of new and valuable standards are now available to the foundry industry.

The American Foundrymen's Association program covered the full range of foundry activities. There were three papers on molding machine practice, eight on steel foundry practice, six on gray iron foundry practice, six on the malleable foundry, four on sand, five relating to scientific management, two dealing with education, two concerned with welfare work, and three covering miscellaneous unclassified subjects.

An extraordinary paper on the history and development of the molding machine was presented by J. J. Wilson, superintendent, Cadillac Motor Car Co., Detroit, and A. O. Backert, secretary of the American Foundrymen's Association. This paper, which contains 81 illustrations of modern molding machines in operation, recounts the history of mechanical molding devices and the development of machine molding methods. The paper contains an interesting and original classification of the various types of molding machines in use today. The manufacture of match plates for stove works first is considered, followed by a discussion of the use of hinged plates for floor and snap flask work. The adaptability of the squeezer is then described, and this is followed by a consideration of stripping-plate machines, roll-over machines, jar-ramming machines, combination machines of various types, automatic molding machines and special machines adapted to gear molding, and to the manufacture of cast iron pipe, radiator loops, etc. French, English and German types of molding machines also are shown.

Another valuable contribution on molding machines was presented by E. S. Carman, of the Osborn Mfg. Co., Cleveland, entitled, "Foundations for Jar-Ramming Molding Machines." This paper gives practical details regarding the foundations required for jolt-ramming machines of various types and includes a large number of illustrations and sketches.

Among the various papers relating to scientific management, that presented by H. K. Hathaway of the Tabor Mfg. Co., Philadelphia, stands pre-eminent. This paper explains the purpose and accomplishments of scientific management and outlines the application of the Taylor system to the operation of a large jobbing foundry. It is stated that the work of properly applying scientific management to a large shop might be undertaken by an experienced foundryman in conjunction with an experienced management engineer, or it might be undertaken by an experienced foundryman, possessing the right qualifications, who would take two or three years to train himself, this period to be spent in other industries in which the Taylor system is in operation. The importance of the tool room and planning department are emphasized and the making of time studies of molding operations is explained and shown graphically by time study records. The importance of time studies covering elemental operations is emphasized.

A paper by R. E. Kennedy and J. H. Hogue of the University of Illinois, entitled "Organization in the Foundry of the University of Illinois," forms an admirable complement to the report of the committee on industrial education, since it embraces an explanation of the methods of our foremost institutions of learning in teaching foundry subjects. The university, of course, does not aim to turn out skilled workmen, but to give fundamental practical training of value to embryonic foundry executives.

The importance of accuracy in modern foundry practice is emphasized by a paper by C. B. Wilson of the Wilson Foundry & Machine Co., Pontiac, Mich., covering the inspection of automobile castings. It is stated that the foundry that endeavors to inspect its own castings and to prevent its organization from trying to impose defective material upon its customers will eliminate nearly all competition. Also the shop with a reputation for quality will obtain from 10 to 15 per cent more for its products than a foundry not so protected.

A paper on pouring systems for gray iron foundries, with 16 illustrations, by H. Cole Estep, associate editor of *The Foundry*, Cleveland, states that as a result of the introduction of molding machines into many foundries handling light work, the men are able to put up more molds in a day than they can conveniently pour off. Under these circumstances, the foundryman finds it necessary to provide mechanical pouring devices. A complete pouring system includes apparatus for handling the metal at the cupola, for transferring it to the molders' floors, and for pouring it into the molds. Various types of apparatus adapted to these purposes are described.

Among the four papers on sand, mention should be made of the preliminary report on molding sand by C. P. Karr, associate physicist of the U. S. bureau of standards, Washington, D. C. This report points out standard methods for making rational and mechanical analyses of sand and states that the bureau of standards contemplates conducting a series of experiments to ascertain the ductility or life of sand by actual molding tests, carried on with various metals poured at different temperatures.

Throughout the various contributions on malleable foundry practice, the necessity for maintaining a uniformly high standard of quality is emphasized. This point is made particularly clear in the papers by J. P. Pero, superintendent and J. C. Nulsen, mechanical engineer, Missouri Malleable Iron Co., by L. E. Gilmore of the Baltimore Malleable and Steel Co., and A. L. Pollard of the Johnston Harvester Co. In a study of the effect of phosphorus in malleable iron castings, Prof. Enrique Touceda, Renssalaer Polytechnic Institute, Albany, N. Y., points out why a phosphorus limit was not included in the specifications for malleable iron castings adopted by the American Foundrymen's Association and the American Society for Testing Materials.

The 25 papers and reports read before the American Institute of Metals included five papers on aluminum and its alloys, four on acid resisting metals and bearing bronzes, and 16 on miscellaneous subjects. Thomas F. Wettstein of the United Lead Co., New York, presented a very interesting analysis of the effect of the present European war on the metal industries. The influence of the war on prices and production and the peculiarities of the war demand for various non-ferrous metals were covered in a very interesting manner. As usual, the Institute of Metals program included a number of valuable contributions from the scientific staff of the bureau of standards at Washington. Dr. G. K. Burgess' paper on "Fusible Tin Boiler Plugs" touches a subject in which everyone concerned with the safe utilization of steam is interested.

The usefulness of the electric furnace for melting both steel and brass was clearly brought out in two papers presented before the American Foundrymen's Association and the American Institute of Metals respectively, by James H. Gray of the United States Steel Corporation, New York City, and F. A. S. Fitzgerald of the Fitzgerald Laboratories, Niagara Falls, N. Y.

# Shop Training That is Worth While

## Details of Methods Followed at University of Illinois In Giving Engineering Students Knowledge of Modern Shop Practice

BY R. E. KENNEDY AND J. H. HOGUE

DURING the last few years there has been much discussion among the employers of technical graduates and those men who are at the head of the administration of the technical courses in the colleges and universities, as to the value of the training in shop practice given to the undergraduate student.

The purpose of these courses, when first started almost 40 years ago, was to give the college course an air of practicality and afford the student some training in the elementary principles of shop work. Very few of the students entering the technical schools then had any acquaintance with shop principles and methods of manufacture, and it was necessary first to instill in their minds a knowledge of the elementary shop practices. Because of the recent advance in trade and manual training teaching in the secondary schools, and the changing demand of the employers of technical graduates, the question as to the advisability of changing, or entirely abandoning the work has arisen, and it has become a vital problem to the schools concerned.

The question was aptly stated by Dr. W. F. M. Goss, past president of the American Society of Mechanical Engineers, when he said, "The time has come when the shop laboratory should cease to be content with a grade of work possible in a secondary school; its work should possess a quality and character which is only possible in the environment of the technical school. This implies that the work of the shop laboratories must be interrelated with that of other technical courses, that such laboratories must cease to use equipment which was purchased one or two decades ago, and that they must cease to be satisfied with methods of administration which, in actual shops, have already passed out of existence. If the shops are to mean anything worth while, they must not only respond to the great and significant changes which have been going on outside, but they must have their part in leading such changes. Their work must not stop with the routine; it must proceed to the development of research that new principles may be established."

With this problem before them, those in charge of the shop work at the University of Illinois set about reorganizing the work and putting it on a basis where the student would derive the greatest benefit. Thus, not merely to develop skill in hand manipulation, but to develop those qualities needed in the executive rather than those needed by the molder, was the problem to be solved.

To do this, the nature of the work had to be changed from mere teaching of manual training to instruction work showing the principles which today govern modern shop organization. As the main object of the whole

A paper read at the twentieth annual meeting of the American Foundrymen's Association, Atlantic City, Sept. 28-Oct. 1. The authors, R. E. Kennedy and J. H. Hogue are instructors in foundry and shop practice, University of Illinois.

FIG. 1—A TOOL ROOM FROM WHICH THE WORKMEN CAN OBTAIN THE RIGHT TOOL WHEN NEEDED IS A PAYING INVESTMENT FOR ANY PLANT

course in shop laboratory work is to teach the engineering students the principles of shop organization, the foundry and other departments of the shop laboratories were reorganized on a commercial basis. A number of standard products were adopted for regular manufacture, among which was a two-cylinder, eight horse-power gasoline engine. This engine was the first product developed and standardized.

Orders are issued from the director's office for the erecting of a given number of engines and each department receives its individual order for the parts which it must contribute towards the product. The method of instruction pursued in the departments of the shop laboratories necessary to carry out this plan can be explained by describing the work as followed in the foundry, with a description of the foundry mechanical equipment. All departments, machine, pattern, forge and foundry, are working on the same general plan, although each has its own distinct problems of production, mechanical efficiency and organization.

The preliminary work of instruction in foundry work is covered by a series of demonstrations and lectures on the essential features of bench and floor molding, coremaking and cupola practice. Immediately after a demonstration of one feature of the work has been made, the students are given some time in which to do the actual work and thus fix the method firmly in their minds.

It has proved to be a fact that the more time spent in demonstration, while reducing the actual working time of the student, has resulted in an increase in the production of castings.

In addition to the reading of notes on foundry practice, the students subscribe to one of the leading foundry magazines and study the articles and advertisements. This gives them an insight into the methods used in the most modern shops and makes them familiar with the diverse problems which foundrymen are constantly encountering in their work. These demonstrations and practice periods so cover the work that when they have been completed, the students can be organized into shop forces, and with the proper supervision carry on the work of a producing foundry.

With this organization, the students are divided into two general groups:

1.—Staff assistants or executives.
2.—Producing force.

The staff assistants are six in number:

A.—Production.
B.—Materials.
C.—Mechanical.
D.—Standard practice.
E.—Accounting.
F.—Experimental.

The producing force is divided into the usual groups of:

A.—Molders.
B.—Coremakers.
C.—Cupola operators.
D.—Cleaning force.

The general plan and relation of the functions performed by the staff assistants can be noted in the chart, Fig. 12. To show the work accomplished, the duties of each assistant will be considered in detail.

The production assistant has charge of shop production, including the working forces and shop equipment. He is responsible for shop output.

As the orders for castings are received, he enters these on his production sheet and announces the schedule for producing these castings. He issues the necessary work orders in their proper order; that is, he first orders the preparing of the material for cores, if cores are to be used, then when this is ready, he issues the orders for making the cores.

When the cores are placed on the stock shelves, the work order to the molder is issued. A work schedule board, Fig. 2, has been placed in the office of the production assistant, on which is kept a record of the progress of the work. The work posted on this board should be performed in one week. All foundry operations on regular

FIG. 2—WORK SCHEDULE BOARD
The staff assistant's office should be a place where is gathered all the information needed for the planning of work and scheduling its progress through the shop

FIG. 3—WOOD MILLING MACHINE COLUMN CASTING, SHOWING THE VARIATION OF WORK IN THE SHOP LABORATORIES

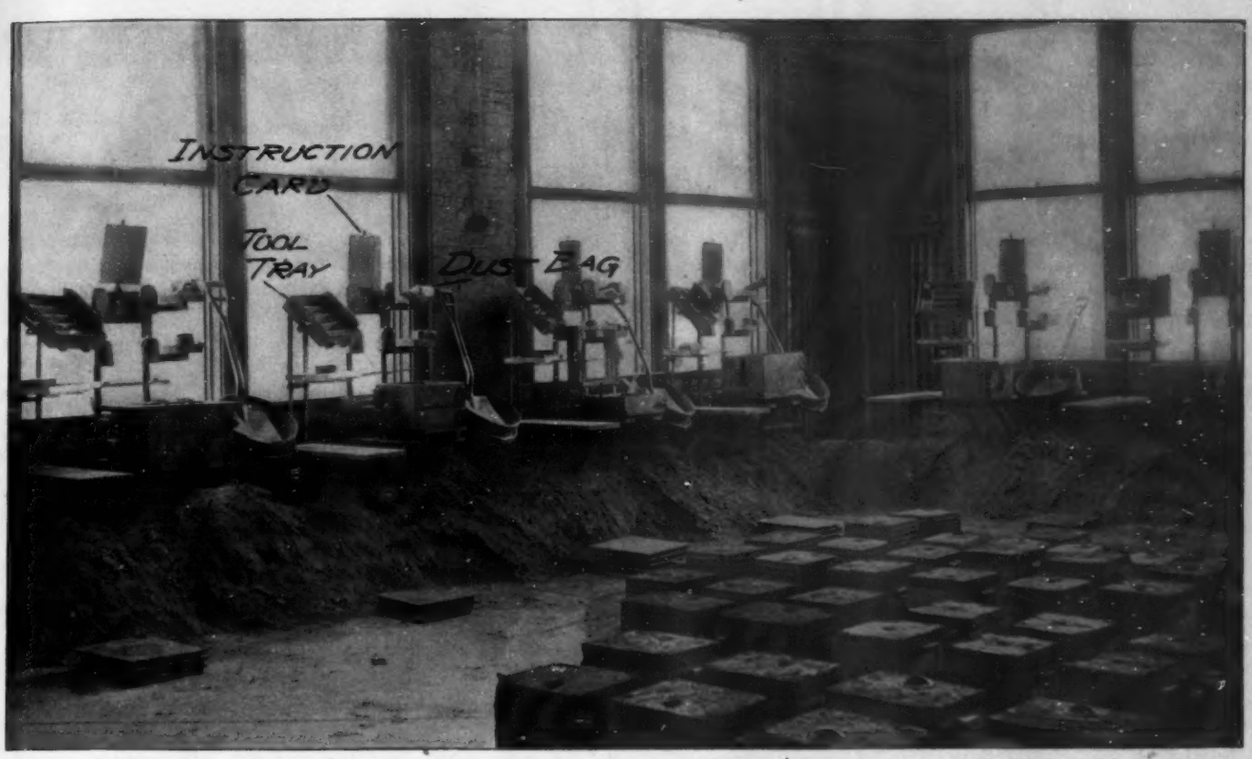



FIG. 4—MUCH CAN BE DONE BY MOLDERS TO SO ARRANGE THEIR TOOLS THAT A MINIMUM AMOUNT OF TIME NEED BE SPENT IN REACHING AND PLACING THEM

products are standardized and definite instructions are issued in the form of instruction cards, Fig. 6, for the making of each core, core wire, mold, the mixing of core sand and cupola work. These cards contain all the necessary information relative to the production of that piece of work. In the case of a mold, it has the size of flask to be used, the tools needed, the cores used, the place where it is to be worked, an operation routine, and a standard time, which is the time in which the piece should be made if no waste effort occurs. This work of making instruction cards is performed by students, in the manner described later under the heading of *Standard Practice Assistant.*

With this detailed information, the production assistant knows in what order the work should be made and how

FIG. 5—CORE RACK WHERE THE SETS OF CORES ARE ASSEMBLED FOR THE MOLDERS

long it should take. The progress board, when filled out, then is before the assistant as a picture of the way his work is being performed. For each pattern to be used there is placed in the grooves of the board a block on which the pattern number is stamped. Other blocks which indicate the different core and molding operations are placed in the same groove. As the cores are made, this information is sent to the production office and colored tacks are placed in the blocks which indicate the state of work on that particular operation.

With the information of this board before him, the production assistant can can at all times tell the stage of progress of each casting. This information is brought to the production office by the inspector who keeps track of the cores and molds made and of the good and bad castings poured, cleaned and delivered. The production assistant also has charge of the operation of the cupola and cleaning of castings, shifting his forces around to suit the needs of the work to be done. The standardization of such work as mixing core sands and cupola preparations, has proved to be an important factor of success in this work of getting good product from comparatively inexperienced workmen. This same principle of standardization of making the difference between planning the work in advance and attacking the same without consideration as to methods to be used.

The production assistant, during the time he is holding that position, makes notes of all conditions of shop operation or methods coming under his supervision, which may be changed or eliminated, thereby increasing the efficiency of the shop or bettering the quality of the work. From these notes, he writes a report on conditions and gives his recommendations for improvements.

These reports are discussed and it is considered that the training derived from the making and discussion of

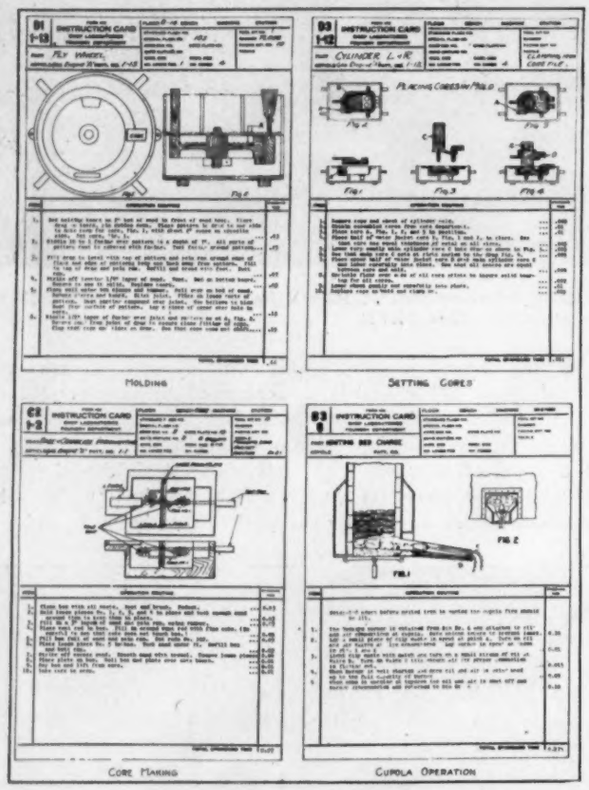



FIG. 6—THE INSTRUCTION CARDS SHOW HOW THE WORK IS TO BE PERFORMED

UNIVERSITY OF ILLINOIS
SHOP LABORATORIES
RECORD OF TIME STUDY
DEPT.

OPERATION Core Making
ARTICLE Piston Pattern 1 - 24
INSTRUCTION CARD NO. C 1. 1 - 24 OPER NO 1
OPERATOR'S NAME Sundell, H. A. NO. 24 SEC A
DATE 9/5 1914 TIME STUDY NO. 2

| ITEM | DETAILS OF OPERATION | TIME ACTUAL | TIME LOST | TIME PROPOSED | EXPLANATION OF OPERATING TIME LOSSES |
|---|---|---|---|---|---|
| 1 | Placing plate on bench | .03 | .02 | .01 | Could not locate right plate at once |
| 2 | Cleaning box | .04 | .03 | .01 | Had been using sand too wet. |
| 3 | Place box in position. Assemble | .01 | | .01 | |
| 4 | Ram first layer of sand. Set rods. | .05 | .04 | .01 | Rods cut too long. Had to exchange |
| 5 | Set 2 loose pieces of box | .01 | | .01 | |
| 6 | Fill box and ram. Strike off. | .04 | | .04 | |
| 7 | Remove loose pieces. Fill with molding sand | .02 | .02 | | Use of iron dryers would eliminate this item |
| 8 | Clamp box. Roll box over on plate | .02 | .01 | .01 | Clamps loose |
| 9 | Rap box, and lift | .01 | | .01 | |
| 10 | Patching torn corner | .04 | .04 | .00 | Box needs repairing. Send to pattern shop. |
| 11 | Blackening | .05 | .02 | .03 | Core maker used a very small brush |
| 12 | Carrying to oven | .07 | .05 | .02 | Had to wait for helper |
| | TOTALS | .39 | .23 | .16 | |

INVESTIGATED BY: (WORK SCHEDULE ENGINEER) STUDY MADE BY: Pope, G. R. (WORK SCHEDULE ASSISTANT)

FIG. 7—RECORD OF TIME STUDY
A time study of a simple operation often brings to light many things to be corrected in the shop practice. A well made study and careful analysis of the results is one of the most beneficial features developed by scientific management

intelligently issue work orders for the making of molds and cores.

He then gives to the materials and mechanical assistants the information as to when and where these cores or molds are to be made and they oversee the preparation so that when the molder or coremaker receives his work order card, he proceeds to the assigned place and finds everything in readiness for the production of the cores or molds, so that he can devote his whole energy to the actual work of coremaking or molding. As the castings are poured, sent to the cleaning room and then delivered, this information is recorded on the board so that the production assistant

terials could be employed to great advantage by many foundries which are at present doing the work by the old *hit-or-miss method.*

### *Work Should Be Arranged*

The workmen, having finished their task, stamp-out on their work order cards and are given another work order, and when they proceed to this work they should find their materials and tools waiting for them.

This method of work forcibly impresses on the student the benefits to be derived from a well-defined plan of knowing how the work is to be done, where it is to be made and when, showthem is one of the most beneficial results of the work in the shop laboratories.

The material assistant performs the duties as outlined on the chart, Fig. 12. These duties, in detail, include the keeping of inventory records of materials, which outline the maximum and minimum quantities of materials to be kept on hand for use in the foundry. By the use of the record sheet, the assistant, at any time, has a knowledge of the amount of stock on hand, and when this stock is reduced to the minimum quantity, he orders a new supply. In ordering he obtains his information as to specifications from the record sheet on

FIG. 8—BRASS FURNACE AND FLOOR OF BRASS MOLDS

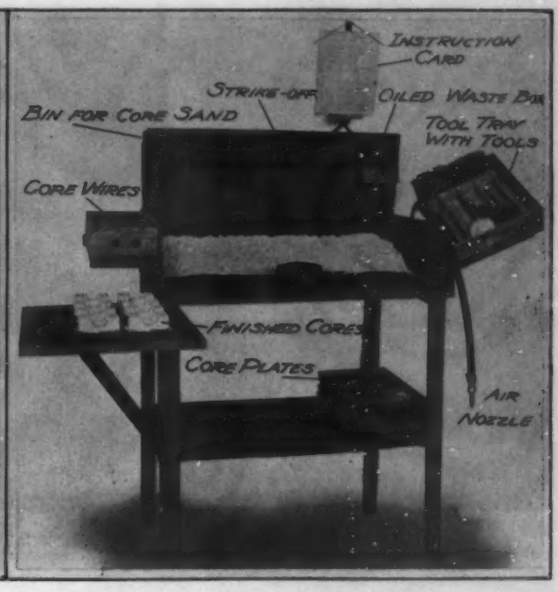



FIG. 9—THIS CORE BENCH ARRANGEMENT ALLOWS THE COREMAKERS TO TURN OUT A LARGE AMOUNT OF WORK IN THE GIVEN SPACE OF TIME

which is outlined the place of purchase, analysis or quality, etc. From the production assistant the materials assistant receives a record of the molds and cores to be made, where they are to be made and when. With this information in hand, it is his duty to see that the molders have all their supplies brought to them, such as cores, graphite, parting compound, nails, etc. He has charge of the mixing of the core sands, cutting of core wires and rods and these he supplies to the coremakers when needed. The instruction cards indicate the kind of core sand needed for each core and these sands are mixed according to the standard prepared, eliminating the usual guessing as to the amounts of sand, binder and water.

The materials assistant's work puts before the student the importance of knowing the amount of stock on hand, the danger of having materials out of stock, and loss in money to the plant when keeping in stock too large supplies of certain materials because the information as to the amount used in a given period of time is not known.

### *Mechanical Assistant*

The duties of the mechanical assistant consist of the maintenance, in an efficient condition, of all shop tools, machinery and equipment. He has charge of the tool room and is its attendant, overseeing the care of the tools kept in this tool room. He has on record a list of all tools, with the condition in which each tool must be kept to be efficient. This record is called the tool standard and tells when to repair or to discard and replace tools. It is his duty to oversee the oiling of machinery, repairing broken parts, or recommending the purchase of new equipment. The flask upkeep comes under his supervision and he sees that the flasks and boards are repaired or replaced. Similarly to the materials assistant, the mechanical assistant receives the notice of molds and cores to be made and he prepares the tools and mechanical equipment needed. It is his duty to keep the molders supplied with the right flasks, boards and tools. The coremaker is furnished with the plates needed and necessary tools for the job to be worked.

For the mechanical assistant to know what tools are needed, he must consult the instruction card, on which are recorded all tools, size and kind of flask, plates, or machines needed for the work. By the co-operation of these three

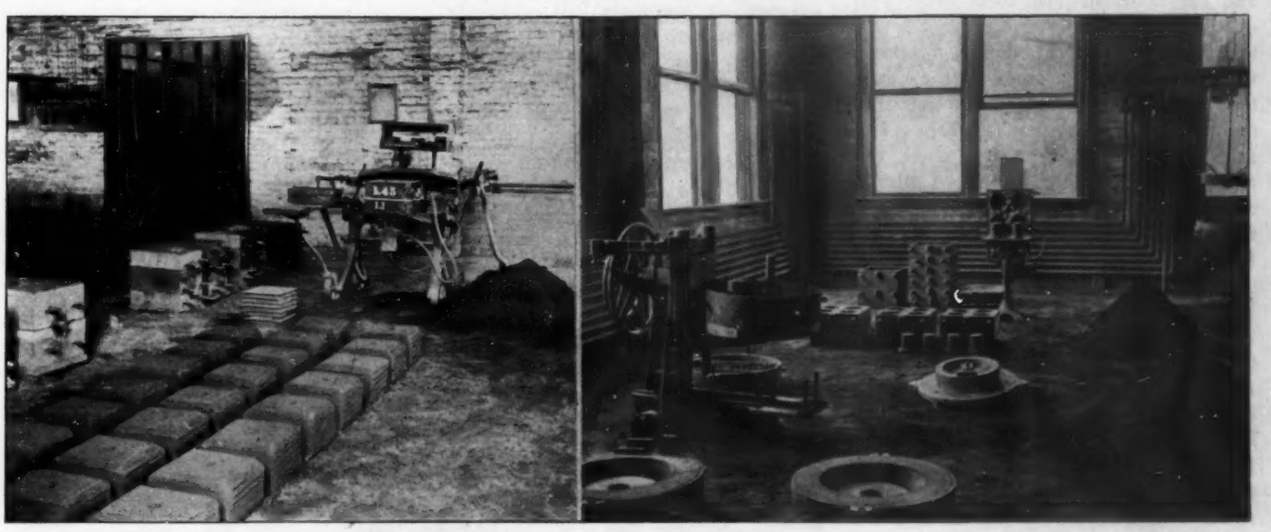


FIG. 10—THE ADVANTAGES TO BE GAINED BY THE USE OF THE DIFFERENT TYPES OF MOLDING MACHINES ARE TAUGHT TO THE ENGINEERING STUDENTS

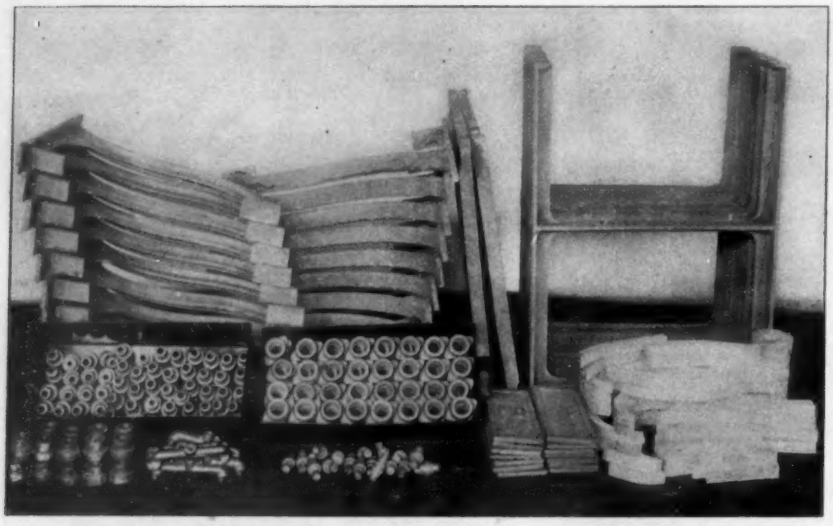


FIG. 11—SMALL IRON, BRASS AND ALUMINUM CASTINGS MADE BY STUDENTS DURING THEIR FIRST WEEK'S SHOP WORK

assistants, the work is all planned in advance, eliminating the trouble so often encountered, when without planning a job is started, and then an endless succession of delays are met, with a consequent loss of several men's time while waiting for flasks to be brought in, cores to be hunted, tools needed but not to be found, and many more difficulties of the same kind.

This brings to the students' attention the value of planning and preparation in a real, practical demonstration. They see, when they do not perform their part, the consequent loss of time of the other men and the result is more thoroughly impressed on their minds than by any other method.

### *Standard Practice Assistant*

The work of the standard practice assistant, as the title indicates, involves the work of standardizing the shop practices, the method of operation routines and the materials and tools used. To obtain standards on core sands, facing mixtures and cupola relining mixtures, the students make a study of the qualities of different mixtures, comparing their qualities with each other. The proportions of binder and sand, the amounts of water, the routine of mixing and time of baking are recorded. In this manner the best core sand mixtures for the various types of cores are found. This information is then recorded on an instruction card and when this mixture is needed the card is used by the materials assistant in preparing this sand for the coremakers. The standard operation routines and times set on the instruction cards of the type shown in Fig. 6, are obtained by making a detailed time and motion study analysis of different men working on the same piece of work. Care is taken to study the job to discover the best operation routine and the time needed to perform the necessary routine items, while the necessary tools and materials are listed.

The studies being completed, any helpful sketch is placed on the card, the operation routine written and then blue prints are made from the tracing. The prints are pasted on heavy cards and filed away in the staff assistant's office to be issued as needed by the workmen.

This is the treatment for all standard work. For miscellaneous work, a temporary instruction card is written, giving the estimated time, and other information required, such as position of gates, venting, setting of cores, etc.

Therefore, a finished instruction card not only tells the workman how to do a piece of work, but it gives the assistants the information necessary to prepare all tools and materials and it tells the production assistant how long a given piece of work should take and the order of operation routine.

This work of investigation and time study has proved to be of more value to the students than any other work they perform, as they find that because certain work has always been performed in a certain way in the past is no reason why it should continue to be done that way. The student is always keeping before himself the idea that probably there is a better way of doing the work and it is up to him to make the most thorough study possible to determine the most efficient way. This is training the student to think and analyze conditions for himself.

### *Experimental Assistants*

Due to the nature of manufacturing work there are always new mechanical problems to be investigated and solved. These are slowly solved in ordinary plants by men whose time is supposed to be spent in the regular work of production. The best equipped and most modern concerns have specially trained men in a separate department whose sole duty it is to investigate and test new methods, machines and materials. The foundry has an unlimited number of such problems and the experimental assistants are given lectures on some of these possibilities, and are then set to work on particular problems relating to this shop. Experiments and tests are made by the students on such subjects as metal mixtures for brass and iron castings, cupola refractories, core sand binders and sands, and on labor saving machines. By carefully analyzing the results of the tests and recording the data obtained, much benefit is gained in the performance of this work.

The work of the accounting assistant includes the care of the inventory records, recording the labor and materials cost on the different orders, and assigning overhead charges to these orders. He obtains the labor cost from the work order cards, and the materials cost from the information records which are kept by the materials assistant.

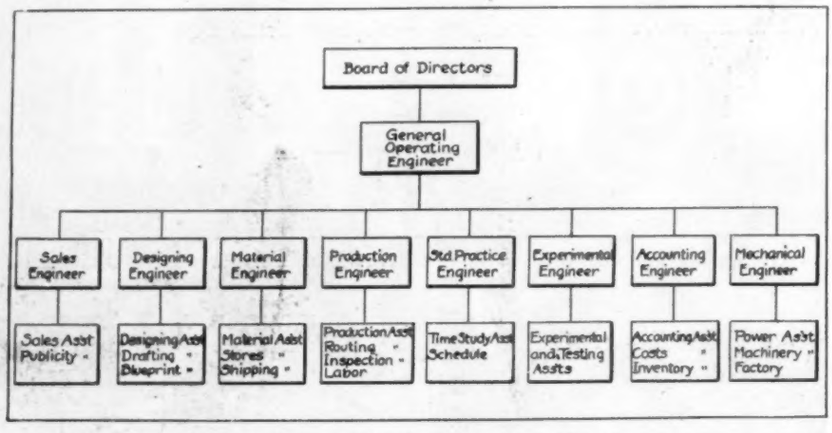



FIG. 12—OUTLINE OF THE OPERATING ORGANIZATION OF THE SHOP LABORATORIES

The specialization of the executive work is as necessary in any manufacturing plant as the specialization of the duties of the workman

All the staff assistants make a report on the conditions that come under their observation, which they think can be bettered and their methods for the accomplishment of these changes are set forth in this report. While the introduction of shop management principles is the main object of the work, the use of a well planned layout of shop equipment has been emphasized and many novel features have been worked out, which could be installed with profit by many shops.

*Tool Room an Essential*

A need was felt for a well-equipped tool room in which to store the small tools, commonly used in a foundry. One of the greatest sources of lost time in foundry operation is caused by the workman not having the proper tool and he either does the work with a less efficient tool, or if the proper tool is supposed to be around, he will spend a long time hunting it. The workman will seldom supply himself with a full set of tools, because some are needed so seldom that he thinks he can get along without them. But there are times when he needs one or more of these and he does not have them. This tool room, shown in Fig. 1, also provides a storage place for riddles, rammers and shovels, which, as a general rule, have to stand all kind of abuse because no definite storage place is provided.

The tool trays stored in the tool room are filled with sets of tools called for on the instruction cards and these are set on the molding and core benches as shown in Figs. 4 and 9. Odd tools are checked out by the workmen on the ordinary brass check system. When these tools are returned they are inspected by the tool room attendant, and any needing repair or replacing are set aside and turned over to the mechanical assistant.

Two of the biggest labor-saving devices designed and put into use in this shop are the molding and core benches shown in Figs. 4 and 9. These benches were designed with a view of having a place for every necessary tool and all materials, and to have each thing within the easiest reaching distance, and a most convenient place for replacing. By this arrangement and the following of the standard operation routines, practically all of the waste or lost effort, so common in bench molding and coremaking, is eliminated.

The principle of the arrangement of the core benches, Fig. 9, is similar to the molding benches. The hopper holds a large quantity of sand, thus allowing a large amount to be delivered to the bench at one time and yet to prevent it from being spread out in the way of the workman. The standard tool tray is placed at the right for convenience in reaching the tools. Being tilted, the tools can be easily seen and reached. At the left is the wire and rod box, off the working surface of the bench, yet easily reached.

These boxes of bent wires are brought from the stock room as ordered by the materials assistant. The empty plates are stacked on the lower shelf of the bench, while the small side shelf is used on which to set the core plate when being filled.

For cleaning the core boxes there is a waste holder for holding the kerosene-soaked waste with which to clean the box, and a compressed air hose with an attached blow gun for blowing out the dirt. The strike-off has its holder on the sand hopper directly in front of the worker, easy of access and can be replaced by throwing it into place. The instruction card holder is so placed that the card can be easily read by the worker.

By this arrangement of the bench, the coremaker has and keeps each thing in its place and loses no time in hunting for the tools, plate or wires needed. His whole time, for this reason, can be devoted to doing the actual productive work of coremaking.

*Ovens and Core Storage*

The oven equipment consists of one large truck oven, heated with an oil burner, and one portable, gas-fired oven. When the small cores are taken out of the oven they are set on the nearby cooling shelves of the rack, shown in Fig. 5. The upper shelves are devoted to stock core storage. As the orders are made up for the different molders, the cores are placed on trays, shown on the bolding benches, Fig. 4, and are taken by the materials assistant to the molding benches or floors when they are to be used.

Some of the machines in use are shown in Fig. 10. The greater percentage of the standard patterns are fitted up for squeezer machine work, although the flywheels, pistons and similar work, are made on the stripping plate and roll-over machines.

The melting equipment consists of two Whiting cupolas and a Hawley-Schwartz brass furnace. A 5-ton Whiting crane commands the entire molding floor space. Figs. 11 and 3 show some of the work which can be turned out by the students after a short period of instruction if the work is administered in the most efficient way.

The ideal of the instructional work is to convey to the student a knowledge of the best methods of foundry practice, to give him the ability to distinguish between good and bad practice, and to instill in his mind the methods used to investigate shop performances.

## Book Review

*Sampling and Analysis of Iron and Steel*, by O. Bauer and E. Deiss, Royal Testing Bureau, Gross-Lichterfelde, Germany; translated by William T. Hall and Robert S. Williams, Massachusetts Institute of Technology; first edition; 373 pages; cloth; published by the McGraw-Hill Book Co., and furnished by *The Iron Trade Review*, Cleveland, for $3 net.

This volume is from the hands of two German investigators and exhibits all the accuracy and painstaking care of the chemists of that country. The object of the work is to place in the hands of chemists a means of avoiding the criticism often made that analyses are inaccurate and that different determinations of the same material by two chemists will not coincide. Much stress is laid on the method of taking the samples to avoid the effects of segregation, supplementing the sample by a microscopic investigation to determine if segregation is present in sufficient degree to lead to widely varying results.

The first portion of the volume is given over to descriptions of correct and incorrect methods of sampling and a discussion of metallography and the apparatus necessary for microscopic study.

The second portion is devoted to methods of chemical analysis. In this the authors have included only such methods as have been found reliable and have stood the test of many years at the Royal Testing Bureau. The translators have amplified these by adding about 25 methods not given in the German edition, which have been tried thoroughly in the laboratories of the Massachusetts Institute of Technology.

Inasmuch as chemical analysis of iron and steel has come to assume so important a place in the industry this volume is valuable. The book is carefully indexed, carries ample halftone illustrations and tables, as well as diagrams of apparatus and footnotes sufficiently ample to point out authorities and give explanations on the same page as the text to which they refer.

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Ground has been broken for a series of important building operations at the plant of the Kissel Motor Car Co., Hartford, Wis. The new construction is for the purpose of doubling the production of Kissel cars in the near future. Two new buildings have been started, one for the storage and shipping departments and the other for the enameling department. The former is 100 feet and the latter 110 feet in length, both buildings being 35 feet in width.

# Checker Design for Open Hearths

## Brick Must Offer Maximum Area for Absorption and a Minimum Retardation to Flow of Gas

BY W. A. JANSSEN

ALMOST simultaneous with the announcement of the discovery of making steel by the converter process by Sir Henry Bessemer, in 1856, the Martin brothers, in France, were attempting to make steel in a reverberatory furnace. Their efforts to make steel of medium carbon content by the melting of pig iron and low carbon wrought scrap were accompanied by failure due to their inability to obtain a temperature high enough for refining and maintaining fluidity while teeming. It was not until they incorporated the Siemens regenerator chambers with their reverberatory furnace that they were able to obtain temperatures sufficiently high to produce steel in an open hearth furnace. Thus began the Siemens-Martin or open hearth process which was destined to supplant gradually the maiden process for the manufacture of steel in large tonnages. The regenerators, then as now, were known as chambers wherein brick were piled in a checker-like arrangement for the intercepting or conserving of heat from the hearth gases, which on succeeding reversals, were to be used to heat the incoming air and gas to insure increased flame temperature.

That the regenerators were a necessary adjunct was recognized, but notwithstanding this, little thought or consideration was given to their design. It is only within the past decade that designers have realized the relatively low efficiency of open hearth furnaces and have directed their efforts toward checker design to obtain maximum heat conservation.

### *Early Type of Furnace Design*

In the early days of open hearth furnace design, vertical checkers were placed directly underneath the hearth, the checker walls serving as supports for the hearth proper. This practice has been abandoned almost entirely due to the weakening of the checker walls arising from alternate expansion and contraction during the periods of heating and cooling. With this attenuated arrangement the checkers were almost inaccessible for making repairs. With the addition of slag pockets, wherein the particles which are carried over mechanically with the outgoing gases are deposited by virtue of change of direction, horizontal checkers are now almost standard practice. The relative size of air and gas chambers, as designed for a furnace using producer gas as fuel, has always been a moot question. In general, it may be said that their proportions are in the same ratio as the calorific capacity of air and gas simultaneously heated. This total capacity ratio is calculated on the basis of moisture, free air and gas for the temperature gradient at which they enter the regenerator and are desired to enter the hearth. This ratio is approximately that each volume of gas requires 1½ volumes of air. The empirical volume of air and gas checker, therefore, is about 1½ to 1. This ratio, however, is not strictly adhered to inasmuch as about 10 per cent more air is used than is necessary for complete combustion and the gas need not be heated to quite as high a temperature.

### *Size of Regenerators*

Aside from accuracy of relative volumes, the dependence of length, breadth and depth are important factors of design. In determining the length of the regenerator in line of gas travel to the stack, it must be borne in mind that the gases must pass through at a slow velocity rate, thereby being assured of a proper cooling of the outgoing gas before going to the stack and a proper heating of the incoming air and gas before entering the furnace. In other words, the larger the cross-section and the lower the velocity, the shorter the length, and the more reduced the cross-section and the greater the velocity, the greater must be the checker length. A satisfactory checker length depending on cross-section is 15 or 20 feet. The cross-sectional area of the checker, whereby is meant the aggregate area of the free air spaces, should be so designed that the gas velocity be not greater than 10 feet per second. The gas passages must be large rather than small, as a safeguard against retardation of gas flow due to friction. It also must be remembered that the area of these passages is constantly being reduced due to deposition of particles of slag, ore dust and other materials from the outgoing gases resulting in further frictional retardation due to the rough surfaces.

With a knowledge of maximum gas temperature and the quantity and velocity thereof passing through the regenerator, the free passage area may be readily determined. With this information and the amount of space occupied by the checker brick, the cross-section of the checker may be calculated.

### *Checker Depth*

Aside from the length and cross-section of the checkers, the function of depth must not be lost sight of. The chief function of checker depth, aside from augmenting ideal cross-section, is to expedite the flow or travel of the incoming air and gas because of the stack-like draft effect which is directly proportional to depth. If the checkers are made deep instead of shallow, the incoming gases are forced by this natural draft to seek the hot places, and the outgoing gases to find the cool areas; thus, automatically, the regenerator temperature is equalized throughout. In early designs, when the checkers were placed beneath the hearth the draft effect of the deep vertical regenerators was greater than that of the present-day long horizontal type wherein often there is no propelling force, except the port uptakes.

The checker volume, whereby is meant the aggregate volume occupied by filled and free air spaces, usually is referred to in terms of *per ton* of furnace capacity. This volume does not include that portion above the checker brick or the flues underneath. In early design, 50 to 75 cubic feet per ton of rated furnace capacity was considered good practice. Present-day design allows between 85 to 95 cubic feet per ton and in one or two instances, up to 110 cubic feet. It is evident that the larger the checkers the greater will be the amount of heat conserved and the lower the temperature of the gases going to the stack. This, however, might be carried to such an extreme that the temperature of the outgoing gases would be equal to that of the incoming, thereby eliminating the propelling force of the cold gases seeking the

A paper read at the annual meeting of the American Foundrymen's Association, Atlantic City, N. J., Sept. 28-Oct. 1.

hot areas. In addition to this, the maximum temperature would be so much reduced as to be insufficient for efficient flame combustion. The high cost of refractories also would limit the building of abnormally large checkers even if they might be desirable. The chief function of the regenerators is to conserve sufficient heat units of maximum temperature to heat the incoming air and gas to a temperature high enough for efficient flame combustion. The temperature of outgoing gases from a checker so designed will be about 300 to 500 degrees Cent.

*Checker Brick Arrangement*

Each designer has his own opinions regarding checker brick arrangement. The fundamental fact which must be borne in mind, however, is that the arrangement must be such as to offer a maximum area for absorption and a minimum retardation to gas flow. In addition to this, the facility with which brick may be cleaned at the end of a campaign must be given consideration. In the old time arrangement which is still popular even today, wherein the brick were so laid as to produce both vertical and horizontal flues, it was almost always necessary to remove all brick for cleaning at the end of a campaign, resulting in much breakage and increased repair costs. When the bricks are laid to produce either vertical or horizontal flues, the flue may be cleaned with a boiler flue brush at the end of the campaign, this arrangement eliminating brick removal. It has long been the practice to use fire brick for checkers. During the past few years the use of silica brick, because of their increased conductivity, has come into favor. The first cost of silica brick is higher, but the gain in efficiency and economy warrants their use. The writer has in mind an installation in which silica checker brick were used, from which 2,500 heats were tapped before it became necessary to replace the brick, except the first two top courses, at the end of a campaign. Some furnace designers have used standard brick shapes, others have designed and patented special shapes and others have designed brick on a basis of thermal conditions.

During the past few years there have appeared in the technical press the results of the investigators, Queneau, Wolodigne and Osann, on the heat conductivity and gas permeability of commercial refractory materials. Unfortunately their investigations were conducted under laboratory conditions and at temperatures considerably lower than actual furnace working conditions. Their results seem to indicate with certainty that the temperature at which brick are burned influences the heat conductivity, that is, the higher the burning temperature the greater is the conductivity. Even though a correct burning temperature might be attained, it would be difficult to exact such requirements from a brickmaker. It also was found that conductivity increases with temperature. The maximum temperature of the checkers, in general, is unknown until the furnace is in actual operation. To design a brick to withstand this temperature might necessitate the specification of a special mixture which might offset the desired burning temperature. With a specific knowledge of the conductivity of the various refractory materials and the amount of heat which must be conserved between reversals, a brick of ideal dimensions, which undoubtedly would be smaller than a commercial brick, might be designed. The efficient conductivity of the ideal brick would be influenced by the reducing action of carbon monoxide on the iron content of the brick mixture and by the carbon deposition which is due to gas permeability in the heart of the brick.

*Ideal Checker Brick*

The gas permeability and carbon deposition, in all probability, are the fundamental causes of checker brick deterioration. All of these theoretical considerations would seem to indicate that the ideal checker brick would be smaller in cross-section than those of present practice. The advantages which they might have are offset by decreased life, increased cost of manufacture, and breakage in handling. The decreased life would necessitate more frequent replacement of checker brick and at the same time would increase repair cost.

Of equal importance with checker design is the proper dependent design of ports, sewers for incoming gas and air, and flue to the stack. They must all be designed to permit a free and uniform passage of air and gas at the desired velocity throughout the entire area of the checkers.

# Report of Electrochemical Society

A LARGE number of members attended the annual fall meeting of the American Electrochemical Society in San Francisco last week. Three professional sessions were held on the first two days of the meeting, Thursday and Friday. Saturday was devoted to inspection trips to various mining, metallurgical, hydro-electric and other engineering operations in the vicinity of San Francisco.

In a paper entitled "Heat Losses From an Electric Furnace", by Willis and Schuyler, the results of an investigation of the losses occurring by gases issuing from the doors, by water-cooling the electrode collars and by transmission through the electrodes, were set forth. A paper by F. T. Snyder, president of the Snyder Electric Furnace Co., Chicago, contained an analysis of the cost of making electric steel from cold raw materials on a small scale for foundry use. R. S. Wile presented a paper entitled "Melting Ferro-Alloys in an Electric Furnace". It contained a description of the economy, in steelmaking practice, of melting ferro-alloys, particularly ferro-manganese, in electric furnaces, subsequently adding them to the melted steel.

*Hold Joint Meeting*

The meeting was coincident with the fall meetings of the American Institute of Mining Engineers and the American Institute of Electrical Engineers. A joint session was held with the latter society on Friday afternoon.

A large number of members remained in San Francisco after the close of the meeting to attend the proceedings of the International Engineering Congress.

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J. D. Nevius, of Philadelphia, who has been sales representative of a number of foundries during the past 20 years, has organized the firm of Nevius & Baldy, M. D. Baldy being the other partner. Offices have been established in the Manhattan building and the firm is prepared to supply castings of any size and any material from patterns furnished and to quote prices on inquiries accompanied by blue prints and specifications.

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It is a poor plan to have the shop littered up with a dozen different brands of unmarked steel—either mark each piece distinctly or stick to one brand.

# Air and Steam as Atomizing Agents

## Open Hearth Furnacemen Find Air in Fuel Oil Feed Produces Greater Absorption of Magnesite Into Slag—Steam Causes Less Oxidation Losses

BY R. A. BULL

THE committee on steel foundry standards of the American Foundrymen's Association, at the suggestion of the compiler of this partial report, who was much interested in the subject, and who offered facilities for research at the plant of the Commonwealth Steel Co., Granite City, Ill., undertook during the past year an investigation into the relative advantages and disadvantages of atomizing fuel oil with steam and air in open hearth steel furnaces. Subsequently, the American Steel Foundries kindly tendered the use of their Indiana Harbor, Ind., plant for making the tests on an acid furnace. The desire was to determine which of the two atomizing agents is preferable from every standpoint including costs, time, quality of product, etc., both in basic and in acid practice.

It is of course necessary to summarize the basic and acid tests separately, and it has seemed most satisfactory for each series of tests to be reported by the member who gave the tests his constant general supervision, and who was consequently in closest touch with all details of the investigation. Accordingly, what immediately follows are the results of basic tests made under the general direction of R. A. Bull, who acknowledges the valuable personal assistance, on the ground, of W. C. Hamilton, of the American Steel Foundries, Granite City, Ill., and W. A. Janssen, of the Bettendorf Co., Davenport, Ia. The basic tests were under the immediate observation of E. R. Swanson, assisted by John H. Locke and others of the Commonwealth Steel Co.

The tests were begun March 29, this year, at the plant of the Commonwealth Steel Co., on an open hearth furnace having a magnesite bottom, the bath of this furnace at the slag line being 21 feet 4 inches by 9 feet 6 inches in area, and 21 inches deep at the center, 2 feet back of the tap hole. The furnace at the time of the tests was receiving initial charges of pig iron and scrap amounting to 56,000 pounds. The exact time for beginning the tests was purposely regulated by the condition of the furnace, on which test operations were begun when it was in perfect normal condition, in the middle of its campaign. It had made 275 heats since the last general repairs.

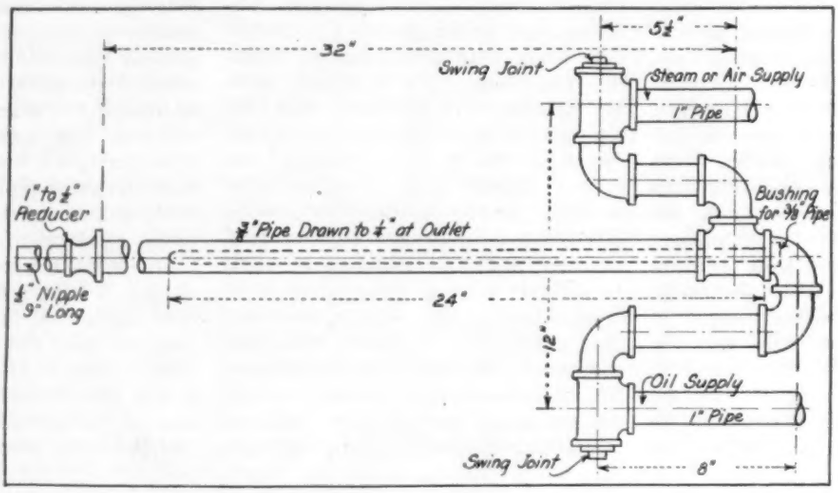


FIG. 1—DETAIL OF OPEN HEARTH OIL BURNER

The furnace presented no extraordinary details of construction from those usually found in steel foundries, and had no water cooling equipment. The furnace stack was 100 feet high, and had an inside diameter of 48 inches. The oil burner is shown in Fig. 1. The oil was delivered to the burners at a pressure of 95 pounds per square inch, and the effect of pump pulsations was counteracted by a standpipe and air cushion.

The oil used was that which is commercially known as fuel oil and came from fields near Lawrenceville, Ill. Samples for B. T. U. determinations were taken at 6-hour intervals throughout the tests. They proved so uniform that no corrections were considered necessary in the figures for oil consumption. The average B. T. U.'s per pound were found to be 19,066, and the average specific gravity was 0.914, which closely corresponds with 23 on the Beaume scale. This oil is of very satisfactory quality for open hearth use and averages about 0.33 per cent sulphur. A temperature of 125 degrees Fahr. for the oil was adopted and maintained throughout the tests, as preliminary observations indicated no improvement at lower or higher temperatures.

All instruments were carefully calibrated just prior to tests and immediately following them, and any necessary corrections were made as shown advisable by the calibrations. These corrections were found to be of very slight importance in any case, due to the accuracy of all the instruments used.

Both steam and air were measured by a General Electric recording interchangeable flow-meter having an integrating attachment. Three separate calibrations of this instrument showed an average error of 0.2 per cent plus. The uniformity of the results in these calibrations was marked and the accuracy of the instrument was very gratifying.

The oil consumption was measured by a Bowser meter, which together with the instruments enumerated below and not otherwise noted are the property of the Commonwealth Steel Co., and have given satisfactory service. Draft pressure and flue temperature at the base of the stack, also temperature of the oil were determined by Bristol recording instruments. The temperature of the bath in the furnace was taken by a Scimatco optical pyrometer. The uniformity of the oil temperature was maintained by means of a Sylphon automatic temperature regulator. The burners and furnace valves were reversed on signal from an automatic alarm attached to an ordinary clock. The time when valves and burners were actually reversed was determined by a recorder made by the Eco Magnetic Clock Co. The tensile tests were made on a Riehle 100,000-

Presented at the Atlantic City meeting of the American Foundrymen's Association.

pound machine and on an Olsen 100,000 pound machine owned by the American Steel Foundries. Two sets of bars were made, one having rough turned grips, and the other having threaded grips. The apparent elastic limit on the threaded bars was determined by means of a modified Berry strain gage having a two-point contact, reading 0.0001 inch and owned by the American Steel Foundries. The Johnson method was employed in plotting curves representing the stretch of the threaded test pieces. The threaded bars were pulled on the Olsen machine. The bars with rough turned grips were broken on the Riehle testing machine, and the yield point of these bars was determined by the drop of the beam. Many expedients were suggested and tried for determining the loss by oxidation. These resulted in a very satisfactory method for weighinng the ladleful of steel on a Fairbanks 5,000-pound rolling mill scale, arranged as shown in Fig. 2. This scale was calibrated several times by placing objects of determined weights in varying amounts on the platform designed for the ladle, to check calculations and verify the belief of the Fairbanks representative that the mill scale would accurately register the expected overload. The average of several test-weighings which were reasonably uniform showed the following results, from which a curve was plotted for the correction of weights observed:

| Load on scale, pounds. | Error, per cent. |
|---|---|
| 51,986 | 1.2 plus |
| 59,966 | 1.7 plus |
| 74,473 | 1.93 plus |
| 81,453 | 2.44 plus |

The amount of metal represented in any *back pits* rabbled out of the spout after removal of the ladle was added to the weight of the filled ladle, and after the heat had been poured any sculls remaining were taken into consideration in determining the tare weight, which included not only empty ladle, but stopper-rod and slag. The scale was placed within 50 feet of the furnace on the pouring floor, and the weight of the ladle was determined with a loss of only a few moments' time. It will be observed that the length of the lever arm readily adapted the use of a scale of such small capacity for this work. The knife edges for the beams were especially made of hardened tool steel. A substantial temporary foundation was placed under all parts of the scale, and a level condition maintained. The bail was removed from the trunnions before the weight was taken.

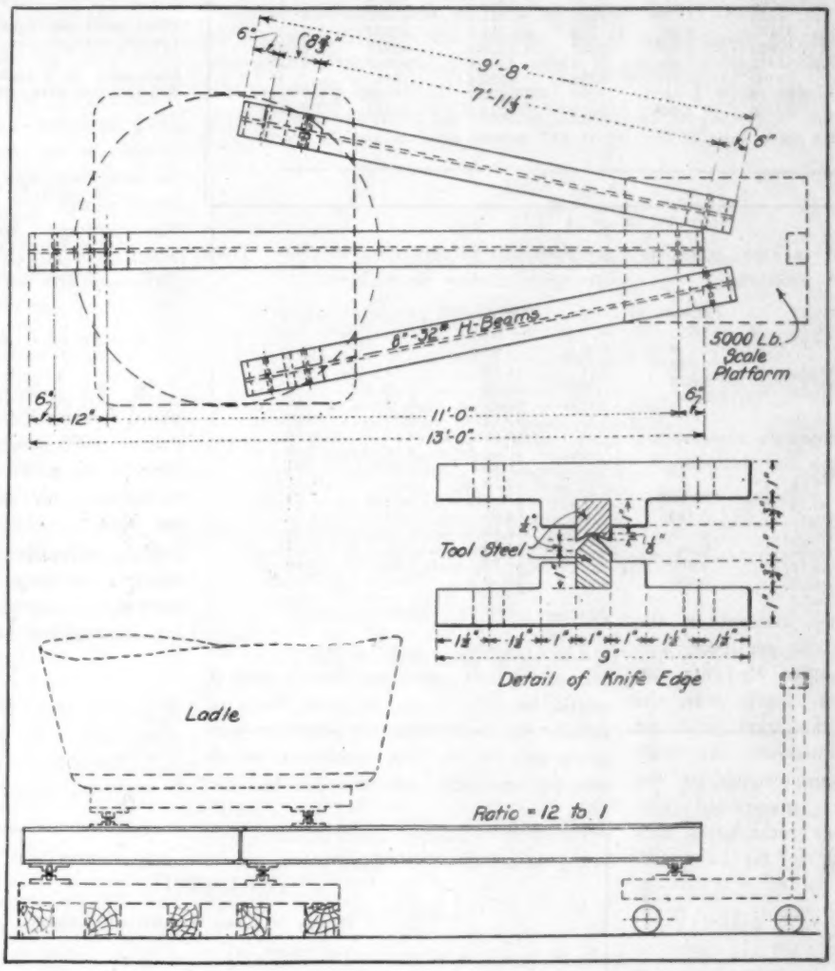


FIG. 2—ARRANGEMENT FOR WEIGHING STEEL IN LADLE

A draft at the base of the stack representing 0.8 inch of water was adopted and maintained throughout the tests, as this was by previous observation believed to be most satisfactory. Periods for reversal of furnace burners and valves were at 15-minute intervals, and so regulated for the same reason.

In the steam tests, the atomizing agent was delivered from boilers showing 125 pounds gage pressure and was superheated by passing through a coil 24 feet long, made of 1-inch pipe, placed through the flue just outside the damper and throttled to a pressure varying from 40 to 60 pounds as desired at the burner. A pressure of 60 pounds was maintained until the stock was melted and the pressure was then reduced to 40 pounds to finish the heat. The degree of superheat varied somewhat and averaged 140 degrees Fahr., which was considered to be conservative for yielding the best results, as ascertained from experience. All members of the committee unhesitatingly agreed that the steam should be superheated, as otherwise there would be reduced efficiency due to saturation, the degree of which would vary greatly in different plants due to distances from boiler rooms and other local conditions. In the air tests, the compressed air was delivered from a receiver showing 80 pounds gage pressure and throttled to a pressure of from 40 to 60 pounds as desired at the burner. The average temperature of the air was 97 degrees Fahr. The amount of metal charged included not only the iron content in these materials, but of course any pig iron found necessary to add after melting. Pig iron and scrap were debited at 100 per cent. The yield was regarded as 100 per cent of the steel produced. In computing oxidation losses, all the iron content found to be representative of the following materials used in the heats was taken into account:

| | Per cent iron. |
|---|---|
| 80 per cent ferro-manganese.. | 12.726 |
| 80 per cent ferro-silicon..... | 40.43 |
| 12 per cent ferro-silicon..... | 86.154 |
| Iron ore ..... | 66.438 |

### *Proportions of Heats*

In each heat 31,000 pounds or 55.3 per cent of chill cast northern pig iron, 17,000 pounds of reasonably heavy foundry scrap, 8,000 pounds of scrap rails, and 8,400 pounds of lime-rock were initially charged. An average analysis of the pig iron shows the following

**Table I.**

**Details of Heats Treated with Compressed Air**

| Consecutive heats from furnace since last repairs. | Weight charged, pounds. | Weight tapped, pounds. | Oxidation loss, per cent. | Temperature of surface of bath, 10 minutes before tap, degrees Fahr. | Oil consumed, gallons. | *Air consumption, cu. ft. | Time of heat, charge to tap, hours, minutes. |
|---|---|---|---|---|---|---|---|
| 275 | 57837 | 53150 | 8.10 | 3170 | 1182.0 | 62205 | 7:45 |
| 277 | 57957 | 53040 | 8.48 | 3200 | 1158.2 | 57893 | 7:20 |
| 278 | 58431 | 54000 | 7.59 | 3200 | 1201.2 | 65406 | 7:31 |
| 281 | 58371 | 53675 | 8.04 | 3200 | 1312.2 | 61654 | 7:45 |
| 282 | 57140 | 52630 | 7.89 | 3150 | 1202.8 | 64679 | 8:00 |
| 283 | 58001 | 53263 | 8.16 | 3150 | 1205.6 | 60206 | 7:35 |
| 284 | 58417 | 53840 | 7.83 | 3170 | 1150.3 | 65909 | 7:35 |
| 285 | 57837 | 52890 | 8.55 | 3225 | 1161.1 | 62291 | 7:28 |
| 286 | 57714 | 53462 | 7.36 | 3200 | 1226.2 | 57806 | 7:40 |
| 287 | 57419 | 52955 | 7.77 | 3160 | 1215.1 | 57838 | 8:05 |
| 288 | 57887 | 53132 | 8.19 | 3200 | 1211.0 | 63908 | 7:50 |
| 307 | 57671 | 52683 | 8.65 | 3250 | 1236.3 | 62728 | 8:05 |
| 308 | 57871 | 53352 | 7.89 | 3150 | 1299.8 | 60368 | 8:30 |
| 309 | 57883 | 53300 | 7.91 | 3300 | 1192.6 | 58847 | 7:55 |
| 310 | 57769 | 53320 | 7.69 | 3200 | 1206.5 | 59988 | 7:50 |
| Average | 57880 | 53246 | 8.006 | 3195 | 1210.7 | 62115 | 7:47 |

*Air consumption on a basis of free air at 14.7 pounds absolute and 70 degrees Fahr.

percentages of the various constituents present in the mixture:

| | Per cent. |
|---|---|
| Carbon | 3.250 |
| Phosphorus | 0.159 |
| Sulphur | 0.040 |
| Manganese | 1.030 |
| Silicon | 0.840 |

An average of numerous samples of scrap rails used, shows the following:

| | Per cent. |
|---|---|
| Carbon | 0.330 |
| Phosphorus | 0.108 |
| Sulphur | 0.067 |
| Manganese | 0.800 |
| Silicon | 0.050 |

The average carbon content in the foundry scrap was 0.20 per cent, and the percentages of other elements can be assumed to agree closely with the averages noted in the steel produced during the tests, Purposely the quality and physical characteristics of the metal charged were maintained uniform and the variable constituents kept low in all the heats so far as conditions permitted, in order that oxidation loss, quality of metal, etc., might be gaged intelligently..

*Heats Treated With Compressed Air*

It is instructive to give some detailed figures as well as averages in the log of observations. The tabulated results in Table I are self-explanatory. Determination in all heats for constituents of slags were made and are indicated by the following summary:

| | Average, Per cent. | Minimum, Per cent. | Maximum, Per cent. |
|---|---|---|---|
| $SiO_2$ | 12.66 | 11.06 | 14.37 |
| CaO | 52.32 | 51.28 | 54.23 |
| $Al_2O_3$ | 1.76 | 0.82 | 3.06 |
| $Mn_3O_4$ | 5.22 | 3.04 | 6.59 |
| $P_2O_5$ | 1.49 | 1.38 | 1.59 |
| S | 0.08 | 0.05 | 0.11 |

The detailed analyses of FeO, $Fe_2O_3$, and MgO are deemed of sufficient importance to justify recording in full. They are given below as follows:

| | FeO Per cent. | $Fe_2O_3$ Per cent. | MgO Per cent. |
|---|---|---|---|
| | 13.97 | 2.83 | 11.74 |
| | 15.48 | 1.42 | 8.82 |
| | 16.66 | 0.25 | 10.39 |
| | 13.04 | 4.55 | 9.66 |
| | 13.77 | 0.36 | 9.27 |
| | 14.46 | 4.23 | 6.94 |
| | 17.56 | 5.34 | 6.08 |
| | 15.88 | 5.30 | 5.65 |
| | 14.38 | 3.23 | 6.81 |
| | 13.86 | 5.13 | 7.83 |
| | 11.69 | 5.74 | 7.35 |
| | 17.12 | 3.74 | 6.96 |
| | 14.34 | 3.56 | 9.64 |
| | 14.88 | 4.38 | 6.66 |
| | 15.60 | 5.19 | 5.07 |
| Average. | 14.84 | 3.68 | 7.93 |

The physical and analytical tests showed the expected uniformity and it would be superfluous to show them in detail. No heat treatment whatever was given any of the test specimens, which insured accurate comparisons of the metal as delivered from the furnace. The average analyses and physical results of tests taken from the middle part of each heat are as follows:

| | Per cent. |
|---|---|
| Carbon | 0.2030 |
| Phosphorus | 0.0140 |
| Sulphur | 0.0226 |
| Manganese | 0.7530 |
| Silicon | 0.3700 |

**Threaded Grip Bars (Modified Berry Strain Gage)**

| | |
|---|---|
| Johnson's elastic limit per square inch, pounds | 20,216 |
| Tensile strength per square inch, lbs. | 67,924 |
| Elastic ratio, per cent | 29.7 |
| Elongation in 2 inches, per cent | 31.5 |
| Reduction of area, per cent | 49.2 |

**Rough Turned Grip Bars (Fall or Beam Observed)**

| | |
|---|---|
| Yield point per square inch, pounds | 43,540 |
| Tensile strength per square inch, lbs. | 69,338 |
| Elastic ratio, per cent | 62.6 |
| Elongation in 2 inches, per cent | 31.1 |
| Reduction of area, per cent | 51.6 |

No apparent unusual effect was observed on the roof or bottom of the furnace, nor was any difficulty experienced at any time in making these heats. The average amount of magnesite, which was largely used for bottom repairs, was 660 pounds per heat.

*Compressed Air Cost Estimated*

On the assumption that in many plants it costs 2½ cents to compress and deliver 1,000 cubic feet of air at a pressure of 80 pounds, the average cost of compressed air can be figured at $1.55 per heat.

Unintentionally samples of slag were taken from only 14 of 15 heats atomized with steam and the determinations are summarized below:

| | Average, Per cent. | Minimum, Per cent. | Maximum, Per cent. |
|---|---|---|---|
| $SiO_2$ | 12.75 | 11.37 | 14.42 |
| CaO | 52.83 | 50.77 | 55.19 |
| $Al_2O_3$ | 2.54 | 1.25 | 3.58 |
| $Mn_3O_4$ | 5.54 | 5.08 | 6.02 |
| $P_2O_5$ | 1.56 | 1.44 | 1.70 |
| S | 0.06 | 0.03 | 0.11 |

**Table II.**

**Details of Heats Treated with Steam**

| Consecutive heats from furnace since last repairs. | Weight charged, pounds. | Weight tapped, pounds. | Oxidation loss, per cent. | Temperature of surface of bath, 10 minutes before tap, degrees Fahr. | Oil consumed, gallons. | Steam consumption, pounds. | Time of heat, charge to tap, hours, minutes. |
|---|---|---|---|---|---|---|---|
| 290 | 57890 | 53276 | 7.97 | 3200 | 1154.6 | 3146 | 7:30 |
| 291 | 57273 | 52547 | 8.25 | 3200 | 1203.9 | 3308 | 8:00 |
| 292 | 57299 | 53275 | 7.02 | 3175 | 1225.7 | 3669 | 7:55 |
| 293 | 58057 | 53476 | 7.88 | 3150 | 1115.4 | 3078 | 7:40 |
| 294 | 57986 | 52873 | 8.81 | 3200 | 1280.8 | 3375 | 7:43 |
| 295 | 58322 | 53642 | 8.02 | 3175 | 1208.2 | 3254 | 7:48 |
| 296 | 57227 | 53131 | 7.10 | 3200 | 1257.0 | 3567 | 8:20 |
| 297 | 57592 | 53340 | 7.38 | 3075 | 1216.5 | 3592 | 7:35 |
| 298 | 57449 | 53230 | 7.34 | 3175 | 1207.8 | 3378 | 7:35 |
| 299 | 57874 | 53564 | 7.44 | 3150 | 1212.9 | 3820 | 8:00 |
| 300 | 57750 | 53800 | 7.08 | 3050 | 1211.2 | 3939 | 8:15 |
| 301 | 57303 | 53200 | 7.16 | 3200 | 1218.9 | 3757 | 7:50 |
| 302 | 57863 | 53766 | 7.01 | 3175 | 1214.5 | 3448 | 7:57 |
| 303 | 57660 | 52912 | 8.23 | 3150 | 1200.3 | 3687 | 8:15 |
| 304 | 58370 | 54240 | 7.07 | 3250 | 1168.9 | 3389 | 7:50 |
| Average | 57727 | 53351 | 7.58 | 3169 | 1206.4 | 3493 | 7:52 |

| | Per cent. FeO | Per cent. $Fe_2O_3$ | Per cent. MgO |
|---|---|---|---|
| | 14.66 | 2.46 | 5.02 |
| | 14.72 | 3.89 | 5.80 |
| | 14.97 | 3.25 | 5.32 |
| | 14.31 | 3.38 | 5.34 |
| | 15.66 | 4.68 | 4.66 |
| | 14.79 | 3.27 | 5.60 |
| | 16.73 | 4.22 | 5.68 |
| | 15.74 | 4.06 | 5.76 |
| | 15.97 | 2.90 | 7.71 |
| | 16.27 | 2.59 | 5.30 |
| | 14.37 | 3.53 | 6.18 |
| | 16.08 | 3.24 | 6.63 |
| | 15.44 | 4.06 | 5.89 |
| | 15.68 | 5.59 | 5.87 |
| Average. | 15.39 | 3.65 | 5.56 |

*Physical and Analytical Tests*

The physical and analytical tests showed the same degree of uniformity as observed in the metal on which air was used. The test bars were unannealed. The average results follow:

| | Per cent. |
|---|---|
| Carbon | 0.197 |
| Phosphorus | 0.0133 |
| Sulphur | 0.0239 |
| Manganese | 0.737 |
| Silicon | 0.357 |

**Threaded Grip Bars (Modified Berry Strain Gage)**

| | |
|---|---|
| Johnson's elastic limit per square inch, pounds | 19,821 |
| Tensile strength per square inch, lbs. | 65,682 |
| Elastic ratio, per cent | 30.1 |
| Elongation in 2 inches, per cent | 30.4 |
| Reduction of area, per cent | 48.0 |

**Rough Turned Grip Bars (Drop or Beam Observed)**

| | |
|---|---|
| Yield point per square inch, pounds | 42,764 |
| Tensile strength per square inch, lbs. | 67,465 |
| Elastic ratio, per cent | 63.3 |
| Elongation in 2 inches, per cent | 31.1 |
| Reduction of area, per cent | 51.8 |

The condition of the furnace in every respect checked satisfactorily with the condition when air was used. The average amount of magnesite used for patching the bottom was 350 pounds per heat.

On the assumption that in many plants a cost of 14 2/5 cents is representative for generating 1,000 pounds of steam and delivering it at a gage pressure of 125 pounds, the average cost of steam used in atomizing each heat is $0.403.

*Other Details of Tests*

In making physical tests on the bars having threaded grips, and on which the modified Berry strain gage was used, a cross-head speed of 0.025 inch per minute was maintained until the apparent elastic limit was reached, after which the speed was increased to 0.78 inch per minute, and maintained until rupture occurred. The bars having plain turned grips were pulled at a cross-head speed of 0.59 inch per minute throughout.

No unusual characteristics of the metal when being poured were observed at any time. Purposely, all heats which were made under any undesirable or abnormal conditions were eliminated, as for example, any in which bottom troubles occurred. Observations of the furnace indicated the desired consistency of operations throughout the 30 heats tested. Observers were detailed to follow every operation throughout the 24 hours of each day, and all observations were carefully charted.

It had been the purpose to supplement this report by photo-micrographs, but there could be no relation whatever established by examination of numerous etched unannealed specimens from these basic heats, under a microscope owned by the American Steel Foundries, and illustrations of the microscopical views would therefore be superfluous. Structures as observed were perfectly normal.

Careful analysis of the tests herein reported indicates that no relation can be drawn between the results with either superheated steam or compressed air as to the quality of the metal produced, time required for making heats, oil consumption, or temperatures secured.

A comparative summary of results is given in Table III, all items being averages:

**Table III.**

**Comparative Summary of Results.**

| | Air. | Steam. |
|---|---|---|
| Weight charged per heat, pounds | 57,880 | 57,727 |
| Weight tapped per heat, pounds | 53,246 | 53,351 |
| Oxidation loss, per cent | 8.006 | 7.58 |
| Time per heat, charge to tap, hours and minutes | 7: 45 | 7: 52 |
| Oil used per heat, gallons | 1210.7 | 1206.4 |
| Amount of air used per heat, cubic feet | 62,115 | ..... |
| Amount of steam used per heat, pounds | ..... | 3,493 |
| Johnson's elastic limit (Berry gage), pounds | 20,216 | 19,821 |
| Yield point (drop of beam), pounds | 43,540 | 42,764 |
| Tensile strength, threaded grip, pounds | 67,934 | 65,682 |
| Tensile strength, plain grip, pounds | 69,338 | 67,465 |
| Elastic ratio (Berry gage), per cent | 29.7 | 30.1 |
| Elastic ratio (drop of beam), per cent | 62.6 | 63.3 |
| Elongation, threaded grip, per cent | 31.5 | 30.4 |
| Elongation, plain grip, per cent | 31.1 | 31.1 |
| Reduction of area, threaded grip, per cent | 49.2 | 48.0 |
| Reduction of area, plain grip, per cent | 51.6 | 51.8 |
| Carbon, per cent | 0.203 | 0.197 |
| Phosphorus, per cent | 0.014 | 0.0133 |
| Manganese, per cent | 0.755 | 0.737 |
| Silicon, per cent | 0.37 | 0.351 |
| Sulphur, per cent | 0.0226 | 0.0239 |
| Temperature of bath 10 minutes before tap, deg. Fahr. | 3,195 | 3,169 |
| Flue temperature, deg. Fahr. | 1,139 | 1,112 |

*Deductions*

It seems possible that there is a relation as to effect on the furnace bottom in view of the fact that the average content of magnesium oxide in the slag on the heats treated with air averaged 52.6 per cent higher than in the case of steam treated heats. The absorption of more magnesite into the slag in the air-treated heats as shown by the slag analysis, seems to tally with the increased amount of magnesite required for bottom patching on these heats.

Although the oxidation losses in the two groups of heats did not vary greatly, the advantage is in favor of steam-treated heats, in which there were apparently about 244 pounds of metal recovered per heat, which was lost when atomizing with air.

As to comparisons of final costs, each plant of necessity must form its own conclusions, arriving at them by the local costs for compressed air and superheated steam as well as by comparative data given. These data may not in every respect seem entirely conclusive to all students of open hearth practice, but are believed to be more reliable for purposes of comparison than anything heretofore publicly reported. Characteristic local conditions must always be taken into consideration, and in respect to these, it is pertinent to emphasize that the 15 heats treated with air were manipulated by the same crews that handled the same number of heats treated with steam, and that there was no prejudice on the part of furnacemen or observers conducting the tests, and abundant opportunity for the closest supervision.

Since the cost of delivering the required amount of air would be invariably higher than that entailed by the delivery of the required amount of steam superheated by any such economical means as is here reported, there would seem to be a considerable commercial advantage in employing superheated steam as an atomizing agent.

There will be observed a striking divergence between the yield point determined by the drop of the beam and the apparent elastic limit as determined by the use of the modified Berry strain gage and the method described in J. B. Johnson's "Material of Construction." This divergence of results emphasizes the necessity for defining exactly not only what is meant by the term *elastic limit*, but the means employed for ascertaining such limits.

# Dynamic Properties of Cast Steel

## Impact Stress Tests of Steel for Severe Service Are Considered of Equal Importance With Fatigue Tests

BY J. LLOYD UHLER

THE recognized importance of knowing something more than the static properties of steel employed in the manufacture of castings for various uses, such as locomotives, turbines, electric cranes, etc., has in recent years led some steel foundrymen to make a thorough study of their product. It is just as essential to know the probable behaviour of steel in service, which is subjected to shock or alternating stresses, as it is to know its static properties. Too much reliance generally is placed upon the limited information furnished by the static tension test, with the result that numerous failures in practice often seem inexplicable, and for that reason experiments were begun, to find some other device which, in a commercial manner, would divulge something concerning the other properties of the castings.

It has been long understood that materials are liable to degenerate in quality at a rate depending upon the service which they undergo. The numerous every-day failures which cannot be accounted for, are forcing the metallurgical investigators to make research and investigations into the action on steel exerted by complicated forces and they realize the fact that resistance to fatigue is not entirely a function of static strength.

In 1907 the manufacture of vanadium steel castings was started on a small scale and one of the claims for this alloy was resistance to fatigue. This claim was investigated to determine whether it could be substantiated, and in July, 1907, test bars of carbon and vanadium steels were prepared, which were tested, by courtesy of the Pennsylvania Railroad Co., at Altoona, Pa., on an improvised vibratory machine which was used for making tests of staybolt iron. This machine was an old slotter that had been equipped for making vibratory tests and was provided with a registering device which gave a complete record of the number of alternating stresses. The bar was fastened rigidly in a vise and extended out to the slotter arm, 8 inches distant. It had a plate fastened to the arm with a hole through it so that the free end of the test bar, which was supplied with a round nut, could be placed in it, with an allowance of ¼-inch play, thereby allowing the test bar to be deflected ⅛-inch each side of the neutral position. This machine gave only 30 vibrations per minute. The size of the bar was ⅝-inch round and 15 inches long.

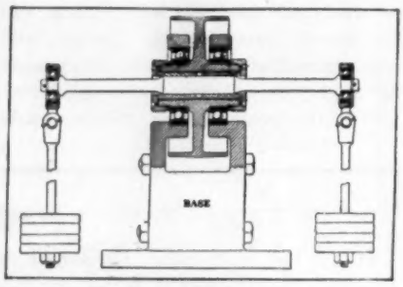


FIG. 2—CROSS-SECTION OF WOHLER TESTING MACHINE, ALSO KNOWN AS THE SOUTHER TYPE

The Turner & Landgraff testing machine was next employed by investigators. This is the new modification of Wohler's method of dynamic testing, which was introduced in 1905 by Professor Arnold, of Sheffield, Eng., and is now widely used.

In making the test the piece is held securely in a vise at one end and is moved backwards and forwards by a slotted arm which communicates to the piece successive permanent distortions in each direction, produced by impact and followed immediately by a pushing motion. As a result, the test piece is fractured finally on the line of the vise at which point the most severe stresses are created. The slotted arm moves on a crank, so that the pushing motion is performed without the interfering factor of *rub* as the slotted arm describes the same arc as the distorted test piece. The design of the machine is shown Fig. 3.

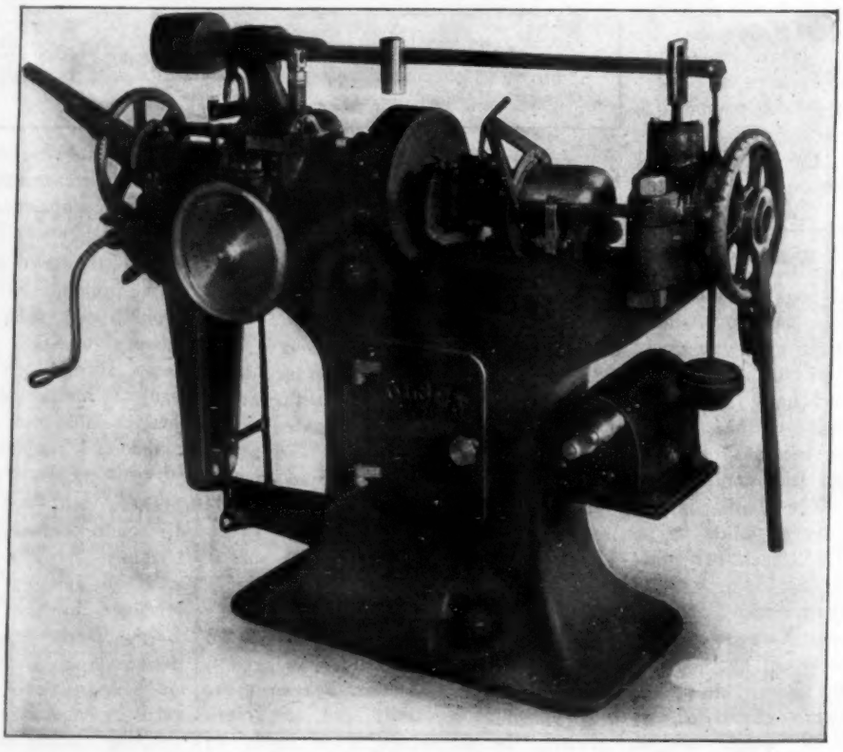

FIG. 3—VIBRATORY TESTING MACHINE DESIGNED BY THE AMERICAN LOCOMOTIVE CO.

The next series of tests were made on the Wohler dynamic or endurance testing machine. It subjects a specimen to reversal of bending stresses on a rapidly rotating bar, but this form of testing often gives widely varying results, even from the

A paper read at the annual convention of the American Foundrymen's Association, Atlantic City, N. J., Sept. 28 to Oct. 1.

# Results of Tests With Casting Steels

Dynamic and Static Results Obtained on:

Castings made from steel containing.....0.20 to 0.25, 0.25 to 0.30, 0.33 to 0.40 and 0.40 to 0.50 per cent carbon
Castings made from vanadium steel containing.....0.23 to 0.28, 0.38, 0.47 and 0.49 per cent carbon
Castings made from chrome nickel steel containing.....0.31 to 0.38 per cent carbon

| | | | | | | | Chemical analysis, per cent. | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Heat No. | Elastic limit, per square inch. | Ultimate strength, per square inch. | Elongation, per cent, in 2 inches. | Red. of area. | Vibration. | Average vibration. | Carbon. | Phosphorus. | Manganese. | Sulphur. | Silicon. | Vanadium. | Nickel. | Chrome. |
| 7540 | 34,900 | 67,400 | 27.5 | 42.46 | 2,354 | | 0.205 | 0.043 | 0.700 | 0.032 | 0.270 | ..... | ..... | ..... |
| 7054 | 34,880 | 63,400 | 39.0 | 55.02 | 2,453 | 2,437 | 0.205 | 0.043 | 0.700 | 0.032 | 0.270 | ..... | ..... | ..... |
| | | | | | 2,248 | | | | | | | | | |
| | | | | | 2,693 | | | | | | | | | |
| 333D | 32,040 | 70,400 | 28.5 | 43.8 | 3,520 | | 0.240 | 0.045 | 0.570 | 0.038 | 0.249 | ..... | ..... | ..... |
| 333D | 32,200 | 69,900 | 31.0 | 51.0 | 2,280 | 3,102 | 0.240 | 0.045 | 0.570 | 0.038 | 0.249 | ..... | ..... | ..... |
| 333D | 31,130 | 70,040 | 30.0 | 47.9 | 3,510 | | 0.240 | 0.045 | 0.570 | 0.038 | 0.249 | ..... | ..... | ..... |
| 8875 | 37,160 | 71,700 | 33.0 | 48.2 | 2,010 | 3,449 | 0.250 | 0.036 | 0.600 | 0.024 | 0.230 | ..... | ..... | ..... |
| 8875 | 36,710 | 70,180 | 31.5 | 52.8 | 1,826 | | 0.250 | 0.036 | 0.600 | 0.024 | 0.230 | ..... | ..... | ..... |
| 229D | 37,240 | 69,460 | 29.5 | 49.6 | 3,128 | 1,918 | 0.250 | 0.032 | 0.610 | 0.028 | 0.259 | ..... | ..... | ..... |
| 229D | 39,600 | 69,680 | 29.5 | 50.1 | 3,770 | | 0.250 | 0.032 | 0.610 | 0.028 | 0.259 | ..... | ..... | ..... |
| 227D | 36,950 | 71,650 | 29.0 | 45.2 | 3,972 | 3,228 | 0.270 | 0.031 | 0.580 | 0.028 | 0.277 | ..... | ..... | ..... |
| 227D | 36,740 | 71,460 | 29.0 | 46.8 | 2,483 | | 0.270 | 0.031 | 0.580 | 0.028 | 0.277 | ..... | ..... | ..... |
| 470C | 38,510 | 76,700 | 29.0 | 44.1 | 3,512 | | 0.270 | 0.047 | 0.630 | 0.027 | 0.280 | ..... | ..... | ..... |
| 470C | 38,050 | 76,100 | 29.0 | 46.9 | 2,940 | 3,104 | 0.270 | 0.047 | 0.630 | 0.027 | 0.280 | ..... | ..... | ..... |
| 470C | 37,240 | 76,500 | 28.5 | 47.4 | 2,860 | | 0.270 | 0.047 | 0.630 | 0.027 | 0.280 | ..... | ..... | ..... |
| 473C | 38,560 | 79,660 | 25.0 | 45.5 | 3,255 | | 0.280 | 0.044 | 0.630 | 0.026 | 0.329 | ..... | ..... | ..... |
| 473C | 38,050 | 80,680 | 24.0 | 42.5 | 3,522 | 3,522 | 0.280 | 0.044 | 0.630 | 0.026 | 0.329 | ..... | ..... | ..... |
| 473C | 38,210 | 78,960 | 27.5 | 45.2 | 3,378 | | 0.280 | 0.044 | 0.630 | 0.026 | 0.329 | ..... | ..... | ..... |
| 624C | 34,750 | 73,400 | 25.0 | 41.3 | 3,803 | 3,867 | 0.330 | 0.034 | 0.610 | 0.030 | 0.290 | ..... | ..... | ..... |
| 624C | 35,800 | 78,380 | 22.0 | 44.3 | 3,930 | | 0.330 | 0.034 | 0.610 | 0.030 | 0.290 | ..... | ..... | ..... |
| 461C | 44,790 | 91,100 | 21.0 | 27.5 | 3,029 | | 0.370 | 0.043 | 0.700 | 0.025 | 0.305 | ..... | ..... | ..... |
| 461C | 45,480 | 91,970 | 21.5 | 36.5 | 3,066 | | 0.370 | 0.043 | 0.700 | 0.025 | 0.305 | ..... | ..... | ..... |
| 461C | 43,930 | 89,870 | 22.0 | 39.4 | 3,679 | 3,258 | 0.370 | 0.043 | 0.700 | 0.025 | 0.305 | ..... | ..... | ..... |
| 481C | 43,280 | 88,580 | 24.5 | 37.7 | 3,009 | | 0.375 | 0.044 | 0.740 | 0.029 | 0.291 | ..... | ..... | ..... |
| 481C | ..... | ..... | .... | .... | 2,945 | 3,115 | 0.375 | 0.044 | 0.740 | 0.029 | 0.291 | ..... | ..... | ..... |
| 481C | ..... | ..... | .... | .... | 3,393 | | 0.375 | 0.044 | 0.740 | 0.029 | 0.291 | ..... | ..... | ..... |
| 447D | 40,600 | 84,720 | 25.0 | 40.1 | 2,958 | 3,154 | 0.386 | 0.046 | 0.680 | 0.035 | 0.300 | ..... | ..... | ..... |
| 447D | 40,100 | 82,710 | 23.0 | 33.8 | 3,350 | | 0.386 | 0.046 | 0.680 | 0.035 | 0.300 | ..... | ..... | ..... |
| 9034 | 57,460 | 96,740 | 19.0 | 30.7 | 1,999 | 1,999 | 0.400 | 0.049 | 0.730 | 0.029 | 0.310 | ..... | ..... | ..... |
| 9034 | 60,100 | 97,340 | 17.5 | 23.0 | ..... | | 0.400 | 0.049 | 0.730 | 0.029 | 0.310 | ..... | ..... | ..... |
| 9215 | 45,660 | 76,620 | 27.5 | 51.1 | 3,000 | 3,265 | 0.235 | 0.047 | 0.575 | 0.030 | 0.250 | 0.145 | ..... | ..... |
| 9215 | 42,590 | 78,200 | 31.0 | 51.8 | 2,904 | | 0.235 | 0.047 | 0.575 | 0.030 | 0.250 | 0.145 | ..... | ..... |
| 464C | 48,550 | 82,620 | 26.0 | 47.7 | 2,978 | 3,057 | 0.235 | 0.028 | 0.590 | 0.025 | 0.280 | 0.180 | ..... | ..... |
| 464C | 48,530 | 79,900 | 25.5 | 49.8 | 2,722 | | 0.235 | 0.028 | 0.590 | 0.025 | 0.280 | 0.180 | ..... | ..... |
| 464C | 46,740 | 73,900 | 29.5 | 52.2 | 3,471 | | 0.235 | 0.028 | 0.590 | 0.025 | 0.280 | 0.180 | ..... | ..... |
| 479C | 47,330 | 75,000 | 29.5 | 53.8 | 3,360 | | | | | | | | | |
| 479C | 46,440 | 72,120 | 29.5 | 52.8 | 3,054 | 3,273 | 0.245 | 0.038 | 0.610 | 0.029 | 0.310 | 0.190 | ..... | ..... |
| 479C | 47,420 | 79,460 | 25.5 | 49.1 | 3,406 | | 0.245 | 0.038 | 0.610 | 0.029 | 0.310 | 0.190 | ..... | ..... |
| 77E | 48,400 | 77,500 | 27.5 | 45.6 | 3,096 | | 0.250 | 0.042 | 0.572 | 0.023 | 0.250 | 0.194 | ..... | ..... |
| 77E | 49,380 | 80,120 | 27.5 | 48.0 | 3,434 | 2,952 | 0.250 | 0.042 | 0.572 | 0.023 | 0.250 | 0.194 | ..... | ..... |
| 306D | 47,500 | 75,040 | 27.5 | 50.0 | 4,218 | | 0.250 | 0.038 | 0.550 | 0.030 | 0.254 | 0.200 | ..... | ..... |
| 306D | 46,810 | 74,980 | 29.0 | 53.2 | 4,102 | 4,074 | 0.250 | 0.038 | 0.550 | 0.030 | 0.254 | 0.200 | ..... | ..... |
| 306D | ..... | ..... | .... | .... | 3,902 | | 0.250 | 0.038 | 0.550 | 0.030 | 0.254 | 0.200 | ..... | ..... |
| 433E | 47,750 | 82,870 | 23.5 | 44.2 | 4,510 | | 0.255 | 0.041 | 0.580 | 0.035 | 0.268 | 0.178 | ..... | ..... |
| 433E | 48,010 | 80,860 | 23.5 | 44.2 | 4,356 | 4,192 | 0.255 | 0.041 | 0.580 | 0.035 | 0.268 | 0.178 | ..... | ..... |
| 433E | 48,310 | 83,540 | 22.0 | 42.9 | 3,710 | | 0.255 | 0.041 | 0.580 | 0.035 | 0.268 | 0.178 | ..... | ..... |
| 372D | 47,500 | 80,000 | 24.0 | 39.0 | 2,966 | 2,966 | 0.260 | 0.035 | 0.510 | 0.028 | 0.260 | 0.203 | ..... | ..... |
| 67E | 49,060 | 82,080 | 26.0 | 44.5 | 3,190 | | 0.260 | 0.039 | 0.624 | 0.025 | 0.290 | 0.205 | ..... | ..... |
| 67E | 47,420 | 78,480 | 28.0 | 48.0 | 3,480 | 3,335 | 0.260 | 0.039 | 0.624 | 0.025 | 0.290 | 0.205 | ..... | ..... |
| 74E | 48,720 | 79,320 | 26.0 | 47.7 | 3,476 | | 0.260 | 0.043 | 0.576 | 0.022 | 0.260 | 0.190 | ..... | ..... |
| 74E | 49,380 | 80,640 | 25.0 | 50.1 | ..... | 3,476 | 0.260 | 0.043 | 0.576 | 0.022 | 0.260 | 0.190 | ..... | ..... |
| 35E | 41,760 | 79,640 | 28.0 | 44.2 | 4,320 | | 0.265 | 0.034 | 0.638 | 0.023 | 0.270 | 0.203 | ..... | ..... |
| 35E | 41,190 | 82,380 | 26.0 | 43.6 | 3,610 | 3,965 | 0.265 | 0.034 | 0.638 | 0.023 | 0.270 | 0.203 | ..... | ..... |
| 226D | 48,120 | 86,220 | 23.5 | 40.1 | 3,834 | | 0.280 | 0.026 | 0.660 | 0.028 | 0.306 | 0.165 | ..... | ..... |
| 226D | 48,620 | 88,720 | 21.0 | 38.6 | 3,728 | 3,781 | 0.280 | 0.026 | 0.660 | 0.028 | 0.306 | 0.165 | ..... | ..... |
| 437E | 64,180 | 111,670 | 15.0 | 28.6 | 2,776 | | 0.380 | 0.038 | 0.700 | 0.034 | 0.335 | 0.188 | ..... | ..... |
| 437E | 61,750 | 113,430 | 14.5 | 24.9 | 2,358 | 2,567 | 0.380 | 0.038 | 0.700 | 0.034 | 0.335 | 0.188 | ..... | ..... |
| Double annealed, "Berry" | | | | | | | | | | | | | | |
| 414D | 75,440 | 133,840 | 13.5 | 20.5 | 3,053 | | 0.470 | 0.042 | 0.730 | 0.032 | 0.361 | 0.185 | ..... | ..... |
| 414D | 74,440 | 140,600 | 10.0 | 15.6 | 3,226 | 3,351 | 0.470 | 0.042 | 0.730 | 0.032 | 0.361 | 0.185 | ..... | ..... |
| 414D | 73,980 | 133,600 | 15.0 | 21.8 | 3,773 | | 0.470 | 0.042 | 0.730 | 0.032 | 0.361 | 0.185 | ..... | ..... |
| Single anneal, "Dividers" | | | | | | | | | | | | | | |
| 9155 | 83,980 | 119,010 | 10.5 | 15.8 | 3,000 | 2,952 | 0.490 | 0.036 | 0.710 | 0.037 | 0.310 | 0.175 | ..... | ..... |
| 9155 | 86,220 | 123,090 | 10.0 | 15.6 | 2,904 | | 0.490 | 0.036 | 0.710 | 0.037 | 0.310 | 0.175 | ..... | ..... |
| 79-D | 61,660 | 105,750 | 19.0 | 48.4 | 3,810 | | 0.315 | 0.039 | 0.540 | 0.026 | 0.306 | ..... | 1.680 | 0.810 |
| 79-D | 62,400 | 105,800 | 17.0 | 31.9 | 3,790 | | 0.315 | 0.039 | 0.540 | 0.026 | 0.306 | ..... | 1.680 | 0.810 |
| 79-D | 64,420 | 106,700 | 17.0 | 35.2 | 3,790 | 3,831 | 0.315 | 0.039 | 0.540 | 0.026 | 0.306 | ..... | 1.680 | 0.810 |
| 79-D | 63,930 | 105,270 | 18.0 | 36.2 | 3,478 | | 0.315 | 0.039 | 0.540 | 0.026 | 0.306 | ..... | 1.680 | 0.810 |
| 79-D | 65,920 | 103,670 | 19.0 | 39.9 | 4,287 | | 0.315 | 0.039 | 0.540 | 0.026 | 0.306 | ..... | 1.680 | 0.810 |
| 505C | 69,500 | 115,670 | 16.5 | 34.0 | 3,514 | | 0.372 | 0.038 | 0.650 | 0.015 | 0.277 | ..... | 1.930 | 1.050 |
| 505C | 70,420 | 114,350 | 15.5 | 29.0 | 3,889 | | 0.372 | 0.038 | 0.650 | 0.015 | 0.277 | ..... | 1.930 | 1.050 |
| 505C | 73,360 | 113,090 | 18.0 | 39.2 | 3,562 | 3,818 | 0.372 | 0.038 | 0.650 | 0.015 | 0.277 | ..... | 1.930 | 1.050 |
| 505C | 65,420 | 113,500 | 16.5 | 35.2 | 4,354 | | 0.372 | 0.038 | 0.650 | 0.015 | 0.277 | ..... | 1.930 | 1.050 |
| 505C | 70,740 | 111,400 | 13.5 | 29.3 | 3,772 | | 0.372 | 0.038 | 0.650 | 0.015 | 0.277 | ..... | 1.930 | 1.050 |

These tests were made on a Turner & Landgraff machine with a throw of $\frac{1}{16}$-inch and a speed of 760.

same bar and does not necessarily detect dynamically weak steel. This is known in this country as the Souther test. Prof. Arnold's original idea in devising this test was to introduce the Wohler method to practical use by reducing the time needed to make this test, namely from days and hours, to minutes. His argument was, that instead of making the test within the elastic limit, but which always was made just beyond it, the result would quickly reflect the liability to fracture within the elastic limit, under stresses applied for a long period. But it was found that the test predicted liability to fracture from causes altogether aside from the Wohler fatigue phenomenon and registered potential brittleness, which the Wohler test not only failed to detect, but pronounced absent. This series of tests was made on the machine shown in Fig. 2.

The investigators then made a series of tests employing the vibratory machine illustrated in Fig. 3. It is built especially strong and the bed, or frame, is so heavy that a specimen of steel, 1¼ inches in diameter and having an elastic limit of 125,000 pounds per square inch, can be tested without causing the frame of the machine to vibrate. This machine was described in detail in the 1914 *Year Book* of the American Society for Testing Materials.

The experiments were made on a Turner & Landgraff machine and the results are given in the accompanying table. The test pieces were 8 inches long, and by reversal, two tests could be obtained from one sample, thereby securing an indication of the uniformity of the metal represented by the test piece. Also the thoroughness of the annealing was thus ascertained, as steel, according to its composition, or rather according to the manner in which the component elements are inter-united, is liable to deteriorate rapidly, or crystallize under the fatigue of continued reversals of stress. The data were gathered with the view of determining the results of impact or fatigue upon steel of different carbon compositions which had been annealed thoroughly in commercial foundry practice. The tabulated record shows that the static results are practically what could be expected from the different chemical compositions, yet the dynamic results prove that even though the chemical analyses are approximately the same in several cases, nevertheless the number of impact stresses are different, due as far as experiments have indicated, to the mechanical energy dissipated during a cycle of stress. It would seem that the lost energy must be transformed into heat, that there must be some form of internal friction in the material that causes wear and structural damage to occur, and that if the action is continued long enough the material will be ruptured. It seems reasonable to consider the amount of structural damage during a cycle of stress to be proportional to the energy transformed into heat, or in other words, to the area of the hysteresis loop. The shape of this loop remains similar to the shape developed under early impact of stress.

I believe that a formula which assumes that the same destructive action which occurs under high stress will continue to act with diminished intensity under low stresses, has some indirect evidence in its favor and is a safer guide for designers than a fixed endurance limit below which destruction action is assumed to cease. I endeavored to chart curves

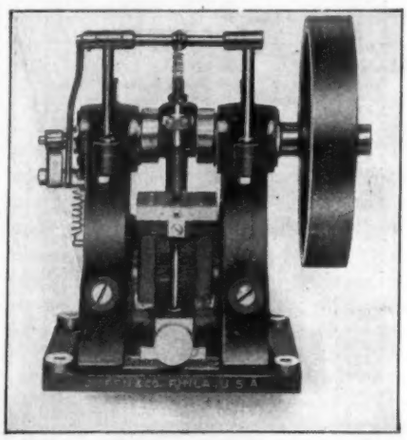

FIG. 4—TURNER & LANDGRAFF TESTING MACHINE

from the accompanying tabulated results, using the carbon contents, elastic limits and ultimate tensile strength as the basis, but found that the results, when plotted, were inconsistent, making it impossible to plot a curve from data obtained from material of such a narrow range.

From my personal experience and observation, I do not believe that sufficient importance is assigned to dynamic strains in steel. The object in testing steel is to secure a product which will give longer life in the service in which it is used. Practically the only tests made are static, and while they definitely determine the efficiency of the steel in resisting severe strains, experience has shown that the strength of the steel does not definitely determine its ability to resist fatigue; and I am convinced that more failures result from the innumerable minor vibratory strains than from those which are more severe.

## Crucible Hints

The Joseph Dixon Crucible Co., Jersey City, N. J., has issued a bulletin containing a number of valuable, practical hints on the care of crucibles. This bulletin is arranged so that it may be conveniently hung up in the melting room. The hints are as follows:

Refit tongs and shanks to crucibles every 30 days.

Keep fuel in dry place, as damp or wet fuel causes scalped crucibles.

Don't wedge metal in crucible.

There should be about 3 inches coke space on sides and 6 or 10 inches of fuel under the crucible, depending upon size of crucible.

Keep an accurate record of heats.

Store crucibles in a warm, dry place about two weeks, then anneal by heating very slowly and gradually, upside down preferably, up to 250 degrees Fahr. or over.

Where oil or forced draft is used, be careful about too much air pressure, which produces an oxidizing flame, thereby eating away the plumbago in crucible.

Set crucible in bed of dry sand when removing from furnace and be sure there are no clinkers left on bottom or sides of crucible.

Don't leave crucible in fire after metal is ready to pour.

If possible, recharge crucible and put back into fire before allowing to cool, if an after heat is to be run.

Don't leave metal in crucible to cool.

Have shanks fit crucible, but if clips have to be used be sure they are wide enough. Better use two sizes of shanks; don't use "gates" as clips.

Avoid hard, sharp pieces of coke under crucible.

Be careful with use of poker; it is very easy to punch a hole through a hot crucible.

Place crucible in center of furnace so as to give equal fuel distribution all around.

Don't set crucible in cold draft or near an open door in winter time.

Avoid fluxes unless absolutely necessary.

Don't drop heavy pieces of metal into crucible from a distance.

Don't drop large pieces of cold metal in crucible containing molten metal, without first heating it, or it will "chill back".

Top of crucible should not set higher than bottom of flue hole at beginning of heat.

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The great field for grinding is in the economical finishing of work, either from the rough or in connection with other machines. In too many cases it has failed because of lack of co-operation between the turning and grinding departments.

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The grinding wheel is in reality a milling cutter which presents millions of cutting teeth to the work every minute. Don't forget that these teeth cut chips, although they are naturally much smaller than those produced by the milling cutter.

# Shrinkage Cracks in Steel Castings

## May be Traced to Law of Segregation of Metals—Chills Should be Liberally Used But Carefully Designed—Gating an Important Factor

BY W. R. BOSSINGER

SHRINKAGE cracks in steel castings constitute a common defect of steel foundry operations. The cause of shrinkage cracks is the same for all castings, but their locations are never identical, owing to the varying forms of different sections. It is not unusual to make castings from one pattern for a period of several months without being troubled by this defect, yet suddenly all of the castings from one heat will develop these cracks. If it were possible to prevent steel from expanding or contracting, this difficulty would be overcome, but since this is beyond control, the alternative must be accepted and this phenomenon must be contended with, namely, the contraction of the steel after the mold is filled. To reduce these defects or to eliminate them entirely, every effort should be made to prevent setting up solid walls that will cause the metal either to stretch or crack when the force of contraction is brought to bear on the walls of the molds.

Numerous appliances, devices, etc., are resorted to to overcome this defect, including the use of brackets, chills, tie bars, the use of sawdust or cinders in the cores, maintaining the metal at a minimum temperature when pouring and keeping it as low in sulphur as possible, as too high a percentage of the latter element is one of the common causes leading to shrinkage cracks. Long castings with attached ribs, flanges or lugs will crack if the sulphur is not well under 0.05 per cent in basic steel, regardless of the fact that other properties and conditions may be favorable to the elimination of this defect. While the various causes leading to shrinkage cracks are well-known to the management of steel foundries, nevertheless this will not eliminate losses from this cause until a knowledge of the cause of shrinkage cracks is imparted to all of the men constituting the organization. The success in keeping down shrinkage cracks is based upon the training of the men who are directly responsible for the development of this defect. Each casting presents a different problem, as the thickness of metal and the lack of uniformity in section will change the location of these cracks in one casting as compared with another of an entirely different form. To train the shop force in eliminating difficulties from this cause, the common sense of the employes is a contributing factor of no little importance. Theory and practice combined, as well as previous experience, likewise should be taken into consideration. It is not unusual to stop cracking in one part of a casting, only to have this defect develop in another part of the same piece. This, however, should not prove discouraging, as it indicates that proper methods are being taken to prevent these defects. The law of the segregation of metals should be recognized as being closely allied to the causes underlying the formation of shrinkage cracks. Segregation will cause the formation of shrinkage cracks on the outside surface of many castings.

A paper read at the annual convention of the American Foundrymen's Association, Atlantic City, N. J., Sept. 28-Oct. 1.

### *The Use of Chills*

The free use of chills is recommended, as they will reduce this defect by controlling the cooling to a greater extent than the use of brackets. Unless efforts are made to prevent the employment of chills that are too large or heavy, or which extend over onto the junction of heavy and light sections, the chills will increase the tendency to crack. If the chill is too large, it will cause shrinkage cracks at the point of the chilled face. This is caused by the too rapid contraction of the casting directly underneath the face of the chill. When the chill is of the proper thickness, it causes the heavy part of the casting to pass through the first stage of contraction, imparting to the metal sufficient strength to meet the stresses caused by passing through the first cooling stage. Stresses in the chilled parts of steel castings are eliminated when the proper chills are employed. The chills will absorb heat from the casting until they reach a temperature of 1,400 degrees Fahr., and on cooling with the casting all stresses should be relieved as the casting strains are released by what practically constitutes annealing at this temperature. The use of chills is resorted to for the purpose of reducing the size of feeders on many castings. The chills are inserted in the molds over lugs and flanges that have light, thin sections on top. A chill should be of sufficient size to set the heavy section of metal before the metal in the lighter section has left its fluid state. In this way fluid steel will be carried to the chilled part and other fluid steel will be drawn from the feeder to replace metal taken from the lighter section. Another reason why the chill is to be favored in place of the use of brackets is that the chill will fall out of the mold when the casting is shaken-out, whereas the brackets have to be chipped off.

Improper gating also is frequently the cause of shrinkage cracks, forming hot spots in line with the flow of metal. If a flat casting is gated in the center and the metal is forced in one direction, causing the sand to absorb and retain heat in this section of the mold, thereby causing a hot spot in the casting resulting in a shrinkage crack, it can be attributed to the remainder of the casting cooling and contracting in advance of the center of the hot section. To further illustrate this point, an I-beam section will be considered, which is gated in the center of the web. If poured in this way, the casting will be liable to crack, as the flanges will resist contraction and the center will be weakened by the higher temperature of the metal due to the method of gating in the web and this part of the section would not have sufficient strength to withstand contraction and the crushing of the sand walls on the flanges.

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When work is to be finished by grinding, the lathe hand must realize that conditions have entirely changed and that his work is not to finish, but to prepare for the grinder. This means about the roughest kind of turning he can do, simply reducing the stock to the point where the grinder can handle it more economically than the lathe.

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When generating bevel gears it is common practice to make the pinion tooth heavier than the gear tooth (according to the ratio) to give additional life to the pinion. Special provision is made on most bevel-generating machines to make this setting.

# Phosphorus in Malleable Castings

## Impact Tests of Malleable Wedges and Bars Support Theory That a Slight Increase of Phosphorus in Malleable Iron is Not Harmful

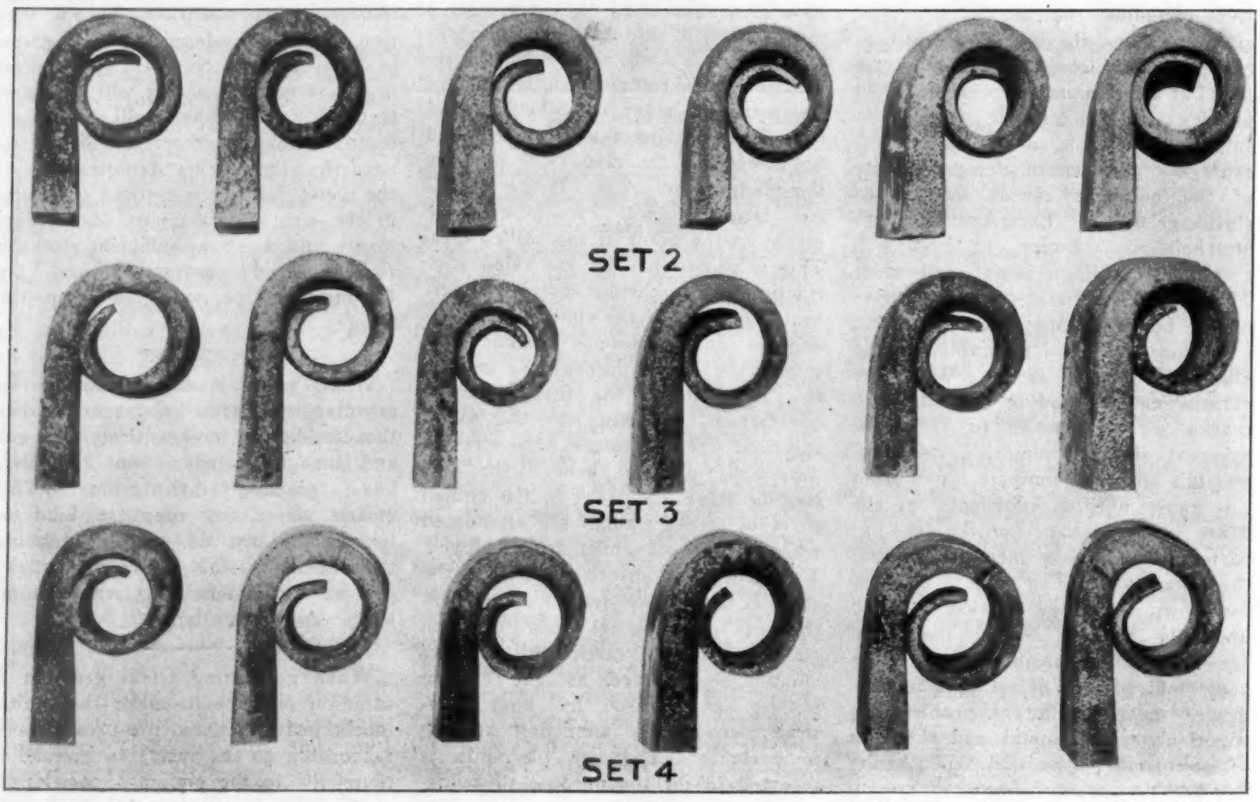
BY ENRIQUE TOUCEDA

IN VIEW of the non-insertion of a phosphorus limit in the specifications for malleable iron castings that have been lately adopted jointly by the American Foundrymen's Association and the American Society for Testing Materials, investigations have been made by the author, the results of which, it is believed, will indicate that these associations have not erred in simplifying the standard to this extent. What has been written may prove not only of general interest to the malleable iron industry, but to those also who have closely followed up the effect of phosphorus in ferrous products.

Having spent the first 10 years of my working life in the manufacture of steel, I come honestly by a bitter prejudice against phosphorus, and while this prejudice, as far as steel is concerned, is still with me as strong, if not stronger than ever, on reminiscing over past experiences and the many cases I can recall, the feeling exists that in numerous instances, mysterious failures in low carbon steel, attributed at the time wholly to a phosphorus content slightly above the bessemer limit, would have been found to have been due to faulty structural conditions, had we at that period possessed the knowledge since gained through the use of the microscope.

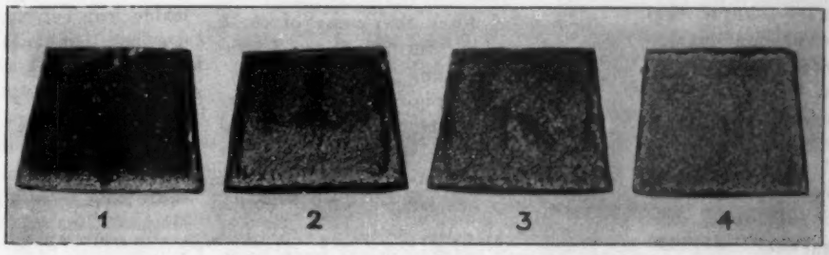
There is ample proof that when phosphorus is accompanied by carbon in the combined state, it has a tendency to embrittle steel in some proportion with increase of carbon. Owing to the familiarity of all with this fact, many have carried their prejudice so far that they deem it unwise to take any liberties with this element, even in cases where the amount of combined carbon is inappreciable, as in wrought iron or malleable iron castings, and there are still individuals who desire to restrict the phosphorus limit in these two products to less than 0.15 per cent. Until several years ago the writer frankly admits that he was strongly of the opinion that no good and dependable malleable iron could be made with a phosphorus content in excess of 0.20 per cent, and this opinion had been strengthened by the examination of many poor samples that had come to hand from various sources. As time passed, however, and the true cause of failure was, through study and investigation, thoroughly understood, the fear of phosphorus grew less, and while it is not my purpose to recommend, as a general proposition, that the manufacturer of malleable iron castings should take undue liberties with this element, especially as it leads to no saving in cost—since pig iron with a phosphorus content of 0.18 per cent is as plentiful and as cheap as that containing 0.30 per cent—still there are particular cases where to use a slightly higher percentage than is customary would result in a better product. Just what is meant by this statement will be made clear a little later when we consider the data which were obtained from the physical tests.

A paper read at the annual convention of the American Foundrymen's Association, Atlantic City, N. J., Sept. 28 to Oct. 1.




TESTED WEDGES REPRESENTING SETS NOS. 2, 3 AND 4

For the purpose of investigating this problem as well as the time at my disposal permitted, and inasmuch as it is an acknowledged fact that the effect of phosphorus in steel is to render it more unreliable under shock than under static stress, I decided to confine my experiments to the testing of specimens dynamically, for the reason that if the metal proved good under such conditions there could be no question as to what would be shown under tensile test. The character of test specimen selected and the method of testing have been described previously in other papers, but for the benefit of those who are not familiar with these discussions, I will state that the test bar is wedge-shaped, 6 inches long by 1 inch wide throughout, the dimensions of the base being 1 x ½-inch and of the top, 1 x 1/16-inch.




FRACTURE OF FOUR MALLEABLE BARS WHICH SHOW THE RESULTS OF INCREASING PERCENTAGES OF PHOSPHORUS

To test a specimen, its base is securely keyed into a slot in a vise free to rotate in the anvil of a drop hammer. The weight then is raised and the free end of the wedge is struck repeated blows; the effect of each blow is to cause the end of the wedge to curl up until finally failure takes place by fracture. The vise and anvil block have been so constructed that the wedge, when struck, receives the full force of the blow without upsetting. To accomplish this, the vise had to be so designed that the operator can turn the wedge in such a manner that the weight is always falling on the highest part of the curled end. The tripping pin that releases the hammer is in a fixed position to deliver an initial blow of 70 foot-pounds, but a little reflection will prove that each succeeding blow is greater than this amount. This is due to the fact that owing to the curl of the wedge the weight has a slightly greater distance to fall before coming in contact with it than when the initial blow was struck, coupled with the fact that the maximum effect of the blow does not take place on the section struck, but on the extreme fibers of a section some distance from the former.

Through the courtesy of two producers of malleable iron castings, I was furnished with sets of test bars, those from Manufacturer *A* having consisted of 24 wedges. The first six of this series were cast from a ladle which contained 30 pounds of air furnace iron corresponding to the mixture that was being run in the foundry at that time. The next six were cast from the same ladle of iron, but after an addition of a certain amount of 20 per cent ferro-phosphide had been made; the next six were cast after a further addition of the alloy, and the last six after a still further addition. In this manner four sets of six wedges were obtained, the composition of which differed approximately only as to phosphorus content. At the time when the wedges were made, a ⅞-inch square bar (not exactly square owing to draft) also was cast for transverse test, and the analyses in Table I were obtained from drillings taken from these bars and not from the wedges.

**Table I.**

CHEMICAL ANALYSIS OF WEDGES CONTRIBUTED BY MANUFACTURER A.

| | Set No. 1. Per cent. | Set No. 2. Per cent. | Set No. 3. Per cent. | Set No. 4. Per cent. |
|---|---|---|---|---|
| Silicon | 0.800 | 0.810 | 0.800 | 0.800 |
| Phosphorus | 0.181 | 0.252 | 0.325 | 0.388 |
| Sulphur | 0.099 | 0.100 | 0.106 | 0.100 |
| Manganese | 0.284 | 0.290 | 0.291 | 0.251 |
| Combined carbon | 0.050 | 0.070 | 0.050 | 0.040 |
| Graphitic carbon | 2.070 | 1.910 | 1.940 | 2.260 |

Unfortunately, the six wedges belonging to Set No. 1 inadvertently were not sent to me and I have since been unable to secure them, but inasmuch as this set was poured from straight air furnace iron without the ferro-phosphide addition, the omission will in no way affect the conclusions that can be drawn from these tests. That this statement can be made safely will be appreciated by referring to Fig. 1, which shows the curled wedges of Sets 2, 3 and 4. All of these, with two exceptions in Set No. 4, were subjected to 30 blows somewhat greater than 70 foot-pounds each. One of the exceptions broke at 28 blows and the other at 27. After the wedges shown in Fig. 1 were photographed they were again subjected to this test until failure took place, and Table II contains a record of the total number of blows required to produce fracture. The metal of which Set No 4 was composed, and which contains 0.388 per cent of phosphorus, is of superior quality and is trustworthy for most purposes. The metal of Set No. 3, which contained 0.325 per cent of phosphorus, is of still better quality than the other samples tested.

Phosphorus exists in iron as phosphide of iron. If the percentages of phosphorus in these four sets of wedges be calculated to phosphide of iron, we will obtain the following results:

| | Set No. 1. Per cent. | Set No. 2. Per cent. | Set No. 3. Per cent. | Set No. 4. Per cent. |
|---|---|---|---|---|
| Phosphorus | 0.181 | 0.252 | 0.325 | 0.388 |
| Phosphide of iron. | 1.086 | 1.512 | 1.950 | 2.328* |

*Approximate.

The ⅞-inch square test bars, previously referred to, were cast at the same time and made of the same metal as the four sets of wedges, and to test these transversely, they were placed on the anvil of the same hammer, on supports 6 inches apart. The following is a record of the number of 70 foot-pound blows required to break them:

| Bar No. 1. Blows. | Bar No. 2. Blows. | Bar No. 3. Blows. | Bar No. 4. Blows. |
|---|---|---|---|
| 22 | 20 | 15 | 5 |

From these figures it would appear that as the section is increased, the evil effects of phosphorus become more manifest. However, bar No. 3 was subjected to fifteen 70 foot-pound blows before rupture took place, which for a metal containing 0.325 per cent of phosphorus, or about 1.95 per cent of phosphide of iron, is certainly no mean test. Bar No. 2, containing 0.252 per cent of phosphorus, or about

1.51 per cent of phosphide of iron, required 20 blows to produce failure, a test which I consider indicates superior metal. Fig. 2 shows the fractures of these four bars which indicate the changes in appearance of the fractures with increase of phosphorus.

Those familiar with the appearance of the fracture of malleable iron when tested transversely, know that the part of the bar in compression always shows up white in color for a certain distance below the surface, and with a more or less granular structure. In Fig. 2 the position of the bars is the reverse of the way in which they were tested, as the white areas represent the compression side. It will be noted that as the phosphorus increases, the amount of white area increases, and in bar No. 4 there is no difference in the appearance of the fracture on either side of the neutral axis.

In an effort to discover if the grain size had increased with the increase of phosphorus, a section was cut from each of these bars, which was polished and etched. Careful microscopical examination and a comparison of one sample with the other revealed no particular difference in grain size in any of the samples, though phosphorus is presumed to have this effect.

To avoid making conclusions from one set of tests only, samples were secured from Manufacturer *B*. The phosphorus determination of this series of wedges showed that the amount of ferro-phosphide used was not sufficient to raise the phosphorus as high as I desired for the investigation, and due to this I requested another set which contained more of the alloy.

The first set, from Manufacturer B, consisted of 15 wedges, three in each set, which were cast in the manner previously described. The following is a record of their phosphorus content and the number of 70 foot-pound blows required to break them:

| Set No. 1. Blows. | Set No. 2. Blows. | Set No. 3. Blows. | Set No. 4. Blows. | Set No. 5. Blows. |
|---|---|---|---|---|
| 12 | 8 | 8 | 9 | 14 |
| 10 | 9 | 8 | 7 | 6 |
| 9 | 9 | 14 | 10 | 8 |
| Phosphorus. | | | | |
| Per cent. | Per cent. | Per cent. | Per cent. | Per cent. |
| 0.159 | 0.169 | 0.180 | 0.195 | 0.220 |

I subsequently received another series of 15 test wedges and set No. 1, untreated metal, had the following analysis:

| | Per cent. |
|---|---|
| Silicon | 0.870 |
| Phosphorus | 0.155 |
| Sulphur | 0.052 |
| Manganese | 0.239 |
| Combined carbon | 0.040 |
| Graphitic carbon | 2.580 |

The number of 70 foot-pound blows required to break these five sets of test wedges and their respective phosphorus content follows:

| Set No. 1. Blows. | Set No. 2. Blows. | Set No. 3. Blows. | Set No. 4. Blows. | Set No. 5. Blows. |
|---|---|---|---|---|
| 6 | 7 | 7 | 6 | 7 |
| 7 | 8 | 8 | 6 | 4 |
| 9 | 6 | 6 | 7 | 5 |
| Phosphorus. | | | | |
| Per cent. | Per cent. | Per cent. | Per cent. | Per cent. |
| 0.155 | 0.181 | 0.207 | 0.235 | 0.277 |

It will be noted that none of these sets of wedges furnished by Manufacturer *B* contains as high a percentage of phosphorus as those furnished by Manufacturer *A*. The metal from which these wedges were cast was of poor quality, but the practice of this shop has since been corrected. Unfortunately, the wedges were not cast as well as they might have been, which also may account for some of the variations in the results. When a test bar is subjected to such a severe test as the one used in this instance, any surface defect on the tension side is bound to influence the result to the disadvantage of the test bar.

**Table II.**

NUMBER OF 70 FOOT-POUND BLOWS REQUIRED TO BREAK TEST WEDGES SHOWN IN FIG. 1

| Set No. 2. No. of Blows. | Set No. 3. No. of Blows. | Set No. 4. No. of Blows. |
|---|---|---|
| 37 | 36 | 27 |
| 41 | 41 | 28 |
| 41 | 45 | 31 |
| 42 | 51 | 34 |
| 42 | 52 | 34 |
| 57 | 54 | 34 |
| Aver. 43.33 | 46.50 | 31.33 |

From a consideration of the facts before us, it would appear that when the amount of combined carbon is very low, the evil effects of phosphorus are slow to make themselves felt, and it requires a substantial increase in this element before a corresponding change in physical characteristics can be noticed.

Patterns occasionally are delivered to casting plants from which it is almost impossible to obtain satisfactory castings free from shrinkage in parts that should be very strong, in spite of the generous use of heavy risers and chills. A shrink results from failure to supply liquid metal to the mold so that as the shell of the casting gradually builds up with solid metal, liquid metal always will be present to fill up solidly the last void in the casting. There are many circumstances that operate to make difficult, or entirely prevent, complete solidity in the average casting. A discussion of these is unnecessary to make clear the point I desire to make, namely, that of two furnace mixtures, one much more fluid at the same temperature than the other; the former will produce castings from the same pattern with less shrinkage than the latter.

I have examined castings that have failed and have tested pieces cut from different portions of these castings to prove that these consisted of metal that was as tough and strong as malleable iron can be made, and that failure resulted because of local weaknesses due to unsoundness from shrinkage.

Unfortunately, according to present practice, the conditions that yield the toughest and strongest malleable are those that have a tendency to produce sluggish metal. Phosphorus being constant, carbon is that element in air furnace iron that contributes more fluidity than any other, but experience has demonstrated that among other accompanying conditions, the lower the carbon approaches that point where the hard carbides in the white iron can still be broken up in the anneal, the stronger and tougher the finished product.

If the facts as I have stated them are correct, then I would like to submit this question for your consideration: In castings made from patterns poorly designed and which the manufacturer is not permitted to alter, or in complicated castings made from patterns that have been designed as well as skill can suggest, is it better practice to have certain parts of the castings strong and solid, and other parts weak and unsound, or is it better to effect a compromise and have the castings of fairly uniform strength and solid throughout? There surely can be only one answer to this question. It is wrong to assume that the physical properties of a metal, as shown by tests, on test bars easily cast sound, are representative of the quality of the metal in any part of a casting.

In my opinion, the manufacturers who are producing the best product are the ones who are constantly aiming to increase the strength of the weakest parts of their castings, the parts in which, due to certain laws, unsoundness is liable to occur, unless new laws are invoked to make these inoperative.

In conclusion, I will acknowledge that the experiments made are few in number, but the paper is not presented as one that has treated the subject in any other than an introductory manner. I hope that others will follow this particular line of investigation so that it can be determined definitely just how far it is safe to make use of phosphorus and to ascertain whether thickness of section is a factor entering into the problem.

# The Metamorphosis of the Foundry

## Annual Address of the Retiring President of the American Foundrymen's Association, Atlantic City, N. J., September 29

BY R. A. BULL

THERE are certain tendencies characteristic of this era of efficiency that we, as foundrymen, should consider in sober-minded fashion. Shops where metals are cast are and should be tremendously concerned in the present widespread movement for the highest industrial development. It may perhaps be truthfully stated that foundries have even now more knowledge to acquire in the attainment of efficient operation and the intelligent selling of their product than do many other manufacturing businesses. Foundries have made vast progress in the past two decades. We still have much to learn from more highly developed lines of industry. Time was in our own recollection when molding methods were of the crudest; when fractures governed the purchase of pig iron; when mixtures were largely matters of guesswork and superstition and when foremen were selected with much thought as to their imposing height and muscular development.

In adapting ourselves to our now recognized higher plane of thought and deed, and in properly striving for the greatest efficiency, I venture the suggestion that we proceed along sane, conservative lines. Human nature is such a peculiar attribute that it frequently urges us to go from one to the other extreme. There seems to me some risk that we may carry our measures for efficient operation too far, if we do not make careful analyses of causes and effects. Specialization may be overdone and can do great injury to plants and workmen if not skilfully kept in proper bounds. It is essential that we keep in mind the highest development of workmen as well as of machines, and avoid making these terms synonymous. If we do not, we will surely and justly suffer from a dearth of skilled mechanics. I was once informed of a workman whose sole task consisted of pressing the treadle of a machine with his right foot. The operator's task gradually gave him an abnormal development on one side of his body, and this was finally so apparent that it was regarded as a humorous matter, until the tragedy of the situation dawned on those responsible for his deformity. The average workman of today argues that the manufacturer is constantly striving to displace men with mechanism. The progressive plant owner will admit the necessity for utilizing mechanical devices wherever these may profitably supersede manual labor, in order that he may meet competition. The intelligent buyer favors the mechanically produced article, in the belief, in the main correct that it is more accurately made. But the whole trend of industrial progress creates a greater need today for skilled mechanics in greatly diversified lines than ever before existed, and I think we want to take good care of our artisans and help to make them better ones. Further, we should aggressively but tactfully do all that we can toward creating in our schools a source of supply of intelligent craftsmen. We do not want to get rid of the skilled mechanic, but rather do we need to apply his trained hands and mind to work that they can best do, and to gradually develop him in all ways that may enable him to better himself and ourselves. Specialization is necessary, but it has its own limitations, if we give proper heed to our future need for skilled workmen as our processes develop, and if we do not have solely in mind the immediate present.

In properly selecting employes with regard to especial fitness, and in maintaining such shop regulations as we believe will conduce to their mental, physical and moral well-being, I venture to advise a more conservative attitude than sometimes exists. The most efficient organization cannot in my opinion be in that plant where the men are expected to be nervously "on their toes" for every minute of time while they are on duty, and where there is not reasonable tolerance in little things. Man is so constituted that he needs throughout each day, whether he figuratively pulls a plant whistle or literally wields a shovel, occasional moments of partial relaxation. And we act unwisely, and indeed inefficiently in the final analysis, if we do not take into full account the human element in man, imperfect as it may be in many respects, but ever present, as it certainly is.

This thought with respect to workmen impels me to hazard an expression concerning foremen. It has lately seemed to me that many of us have maintained a rather unjust and thoughtless attitude toward our foundry foremen and their assistants on the molding floor and in the coreroom. Do we often stop to think of these except from the standpoint of the amount and quality of work they can get out of their men? Do we pause to consider the thanklessness of the foundry foreman's job, day in and day out? Have we often given him opportunity for hope that he may aspire to better things in this age when technical men are much in demand for higher executive positions in our business? Under ordinary circumstances when we need an assistant foundry foreman, we select a dependable skilled molder. Formerly when a superintendent was wanted, a head molding foreman of proved mechanical and executive ability was often promoted.

In later years, not a few of the many ambitious technical graduates from our colleges happily have looked to the foundries as likely places for advancement, and a suitable field for the application of their theoretical

*The annual business session of the American Foundrymen's Association, which took place at the Hotel Traymore, Atlantic City, N. J., on Wednesday evening, Sept. 29, in connection with the convention of the allied foundry organizations, was noteworthy on account of the splendid address of the retiring president, R. A. Bull, manager of production, Commonwealth Steel Co., Granite City, Ill.*

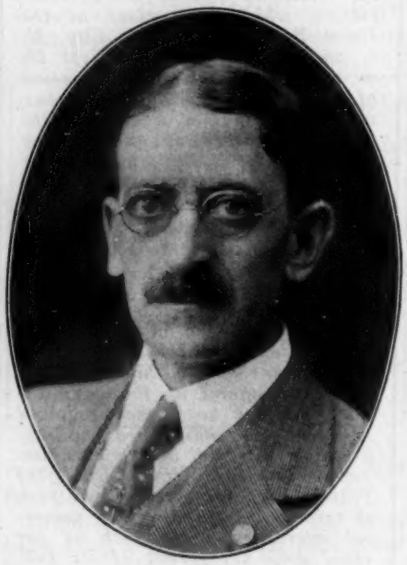
*The address contained an illuminating account of the activities of the American Foundrymen's Association during the past year, which clearly indicates the scope and value of the work carried on by this great organization. Mr. Bull, however, by no means confined himself to the immediate affairs of the organization of which he is the head, but presented, in addition, a masterly analysis of several of the most important problems now facing the foundry business. In this respect, therefore, his address is of universal interest, and inasmuch as our space does not permit of its publication in full, we are presenting only those portions that deal with the casting industry as a whole.*

knowledge. We find good use for many such, but frequently along special lines that do not provide the closest knowledge of operations distinctly peculiar to melting, molding and core-making. When we require an assistant for general plant supervision, we are much more apt to select the young engineer than the foundry foreman, who is frequently left to the sand heap and his own salvation until he gets too old for the job, and wearies of his undeniably annoying responsibilities.

Judging by modern methods of selection in promotion, the foreman should be given opportunities that he does not, according to my observation, at present enjoy in some foundries. And looking at the situation from the viewpoint of efficient production, I admit to being one of those who yet strongly believe that actual experience in getting one's own hands into things, and the ability to personally and satisfactorily perform operations that are given one to oversee are very important elements of preparation for executive work, not always essential, but invariably desirable. I know from my limited experience that wonders can be done along educational lines with foremen of middle age who had the advantage of only a half dozen years at school. A most creditable knowledge of mechanical drawing can be acquired by such men, when it is tactfully presented, and the value of these foremen to the plant organization is thereby greatly increased with slight direct expense, which may well be disregarded in consideration of the lasting benefits secured.

### *The Consulting Specialist*

I have referred to efficiency as applied to workman and foreman. A few comments concerning the consulting foundry specialist are apropos. That this individual has a legitimate function to perform in modern founding is granted by all who consider the matter impartially. There are persons whom nature has not supplied with that amplitude of patience needed for the performance or supervision of routine affairs, but whose ready perception, ability to develop possibilities in previously untried methods, and temperament for analytical study of mechanical and scientific problems admirably fit them for experts to be engaged for working out special processes, or bringing to light obscure causes for trouble. It is well that such persons are available and it is not to their discredit that they may be jokingly referred to as "efficiency doctors." Their greatest handicap seems to me to lie in themselves, and to be due to personnel. Expressing the proposition plainly, there is among these self-advertised exponents of efficiency, a regrettable number of pseudo-experts who have failed to make good at specific tasks in the foundry business, and who have entered the consulting field as promising better returns to those who have the faculty of talking well and magnifying the importance of their personal knowledge to credible foundrymen in difficulties. One of these individuals after a half-hour's hurried walk through a large foundry that he never saw before, comfortably seated himself in the manager's office and delivered himself of the definite statement that the foundry was being operated at 70 per cent of its efficiency. Another rash gentleman publicly advertises: "You get immediate



R. A. BULL

results and begin at once to make savings on fuel, material, etc., bettering the product 24 hours after consulting me. You make no experiments. Every foundry needs our facts, figures, and efficiency methods." And still another, throwing self-effacement to the four winds, is responsible for this astonishing printed notice: "If you are having foundry troubles consult me, the man who knows foundries from A to Z. No matter what the question is, if it pertains to the foundry, I can solve it and save you money. There is absolutely nothing in connection with foundry work of which I am not thoroughly master."

It is to be regretted that there is not universally among consulting men in this field that ethical point of view which exists among consulting experts in many other lines of endeavor, and which serves to discredit exaggerated claims, difficult or impossible to substantiate. We as foundrymen can advance our own interests and can be of service to those foundry experts who are of real help to us, and whom consequently we are glad to occasionally engage, by strongly discouraging absurd claims, and by warning the unwary foundryman in trouble to beware of the personage who has learned it all.

### *The March of Progress*

During the present generation there have been such revolutions in the cost of production of cast metals of all kinds, that a brief story of this progress has all the interest of magic for its readers. Within the recollection of some of my hearers aluminum, which before the present war was quoted at 22 cents, sold for $90 per pound, and steel castings which now sell frequently at 3 cents per pound were never purchased 60 years ago for less than 12½ cents per pound.

Metallurgical processes have indeed wrought wonders in making available for man's daily use, those ferrous and non-ferrous alloys which take definite form in molding sand. The development of the foundry is a most important feature of the social and industrial advancement of the human race. On the American continent, as in Europe, tyranny has been overthrown in the past mainly by the use of castings in various forms. The venerated bell which has its permanent shrine in Philadelphia, and which rang out in 1776 the declaration that the American people would henceforth exist only as an independent nation, was born in a humble foundry and was literally cast three times before its makers were satisfied with its qualities. Paul Revere in his own day achieved more fame in casting and forming precious metals than in making his historic midnight ride. The beauty of art, the sentiment of commemorative objects, the utility of present day necessities of domestic and industrial life are in enormous degree the products of the industry of which we are servants.

The sand pile has indeed fulfilled a useful and honorable mission. How can we doubt that in future years, the art of casting metals will make much greater strides than in the past? Foundry scientists were never before so numerous and so practical as today. We are rapidly acquiring a very comprehensive knowledge of the peculiarities of the elements and their behavior when placed in combination with each other. Certain characteristics which they possess are today

(*Continued on Page 660b*)

# Foundry Exhibits Attract Interest

## Displays at Atlantic City Convention of American Foundrymen's Association Show Advance in Foundry Equipment Manufacture

UNUSUAL facilities both for the entertainment of visitors and the display of foundry and shop equipment combined to give a distinctive character to the tenth annual Foundry and Machine Exhibition, which is being held on Young's Million Dollar Pier at Atlantic City, N. J., this week, concurrent with the annual conventions of the American Foundrymen's Association and the American Institute of Metals. The show, which is being conducted under the auspices of The Exhibition Co., opened at 10 a. m., Saturday, Sept. 25, and will close Friday evening, Oct. 1. Owing to the fact that Atlantic City is purely a pleasure resort without industrial or business establishments in the immediate vicinity that might divert the attention of the visitors, it was decided not to operate the exhibit during the evenings, as heretofore, although the display was open and lighted after the dinner hour for the benefit of those who might wish to make superficial inspections or to avail themselves of the usual ball room and promenade attractions of the pier.

The show now in progress is the first to be held east of the Allegheny mountains since 1907, when the convention and exhibition took place in Philadelphia. It has attracted, therefore, a large number of foundry and shop executives from the eastern states who had found it impossible to attend the immediately preceding shows, and these, combined with the large number of westerners who took advantage of the opportunity to renew their acquaintance with the Atlantic seaboard, served to swell the attendance to unusually large proportions. The manifold attractions of Atlantic City as a pleasure and health resort also, undoubtedly, added to the number of visitors who viewed the displays. A comparison of the 1915 exhibition with that held in Philadelphia in 1907 reflects the tremendous progress of the metal working industries during the past eight years. At Philadelphia there were 67 exhibitors; at Atlantic City there were nearly 125, or double the number at the last previous eastern show. This increase in the number of exhibitors finds its counterpart in the increased space occupied by the various displays, which has much more than doubled in the period under consideration. Furthermore, this expansion indicates a rapid and healthy growth in the importance, wealth and volume of business of the exhibitors and the industries to which they cater; in fact, the growth of the metal trades in power and wealth during the past few years has been matched only by their corresponding advances along technical lines.

At the Philadelphia exhibition the molding machines were of a comparatively simple character; the combination machines of the present day had not been invented. Many of the auxiliary appliances now considered indispensable in up-to-date foundries for handling sand and other raw materials, for controlling melting processes and for trimming, cleaning and finishing castings were unknown eight years ago. At that time also, the electric furnace, as far as the practical foundryman was concerned, was in its infancy, and many of the other applications of electricity to foundry work with which we are familiar today, such as arc welding, were in their incipient stages. Sand blasting, as we understand it now, was unthought of and production records that are commonplace at present were considered unattainable.

The ingenuity of man, however, has no apparent limits and there is little doubt that the approaching decade will witness developments of a mechanical and technical nature far surpassing those covered by the period between 1905 and 1915. Along material lines, the progress of the

MAIN AISLE IN MACHINERY HALL

human race moves with ever increasing rapidity, as the boundaries of physical knowledge become further extended. Even a devastating war that has perverted the productive energies of over half the civilized world for more than a year has not stayed the march of progress. Tangible evidence of the important technical advances during the past year of bloodshed and disorganization is found in many of the displays at Atlantic City this week.

*Increasing Use of Electricity*

The molding machine manufacturers have been busy improving their product in many directions. Electricity is now utilized for performing many operations heretofore possible only by hand or with compressed air. The foundryman, therefore, now has a choice between pneumatic or electrically operated devices, and the necessity for hand labor in putting up molds has all but disappeared. Machines are now provided which not only ram the molds, roll over the flasks and draw the patterns, but also propel themselves along the floor as the sand heap is consumed.

The Osborn Mfg. Co., Cleveland, displayed a complete electrically-driven jar-ramming roll-over pattern-drawing machine, which may be constructed to handle molds of the largest size. The jarring motion is provided by two cranks, running in an oil bath and driven by a 7-horsepower motor, the customary cam mechanism having been dispensed with. The mold is rolled-over and the pattern drawn by another motor of 3½-horsepower operating through a worm gear. This motor is controlled by an automatic push button system, the jar-ramming motor being controlled by a one-point controller of the crane type. The operator's duties are, therefore, exceedingly simple and all of the machine movements are executed by one of the two electric motors. The 42-inch machine shown at the exposition had an 18-inch draw and has been successfully employed in turning out castings for an eight-cylinder automobile motor. A special foundation of ten piles driven into the sand under the pier was provided for this machine. In addition the Osborn company displayed several types of squeezers, including split-pattern, jolt and plain squeezers, the latter being provided with sand-straddle base; a jolt-ramming machine for making cores, a small roll-over machine, a roll-over hand jolt, roll-over rock-down and roll-over drop-draft machines also were shown.

AISLE IN MACHINERY HALL

*Combination Split-Pattern Machine*

A new combination jolt and squeeze-ramming split-pattern machine was shown by the E. H. Mumford Co., Elizabeth, N. J. For certain classes of work, where there are intricate parts to the mold and pockets of sand, the combination of jolt and squeeze ramming is particularly desirable. In the Mumford machine, the jarring cylinder is placed inside the squeezing cylinder; a 4½-inch jolt cylinder and 12-inch diameter squeezing cylinder was provided on the 14 x 16-inch machine on display. This machine is equipped with a mechanism whereby the pattern is started from the sand by hand and finished by power after a draft of 1 inch. The Mumford exhibit also included plain jolt-ramming machines, plain squeezers, etc., built after the designs of the late E. H. Mumford.

*Pattern Drawing Machine*

The extensive exhibit of the Tabor Mfg. Co., Philadelphia, in the machinery hall extension, included a new portable combination shockless jarring roll-over and pattern-drawing machine involving an unusual combination of operation. This machine combines the characteristic Tabor shockless jar-ramming and roll-over straight draw features in one apparatus. The machine exhibited, which was of 18-inch nominal size, provided with 8-inch straight pattern draft, is designed to handle flasks 18 inches wide, 36 inches long and 12 inches deep weighing not to exceed 450 pounds, with 80 pounds per square inch air pressure. The Tabor exhibit also included examples of the several other types of machines manufactured by this concern, all of the equipment being shown in operation.

Operating exhibits of the extensive line of molding machines manufactured by Henry E. Pridmore, Chicago, were found in the machinery hall. Prominent in this display was a new combination jar-ramming rock-over drop machine that has distinctive features. A complete description of this machine will appear in a later issue of *The Iron Trade Review*. The Pridmore exhibit also included machines of the following types: stripping plate, hand rock-over drop, power rock-over drop, squeezer, plain electric and combination jarring.

The latest types of modern molding machines were displayed by the Arcade Mfg. Co., Freeport, Ill. In addition to their usual features, these machines are now provided with a pneumatically operated ratchet mechanism by means of which they may be propelled along the sand heap as the work progresses. This relieves the molder of considerable arduous labor and tends toward greater efficiency. In addition the Arcade company showed jolt-ramming machines, both plain and combination types; squeezer machines operated by hand or air; core jolters and other equipment including the Brillion pouring device developed by the Brillion Iron Works, Brillion, Wis.

The Berkshire Mfg. Co., Cleveland, featured its standard automatic type of machine. This machine not only performs molding operations, but riddles and handles the sand, being equipped with suitable elevators, hoppers, sifting devices, etc. Air and hand-operated squeezer machines were also displayed, together with core machines, vibrators, special flasks, etc.

The Buch Foundry Equipment Co., Bridgeport, Pa., made an operating exhibit of molding equipment including a hand jar-ram, squeezer, roll-over and pattern-drawing machine, and an electrically operated jar-ramming, squeezer, roll-over and pattern-drawing machine.

The well known line of machines produced by the Herman Pneumatic Machine Co., Zelienople, Pa., was adequately represented with working displays including a 40 x 56-inch machine provided with independent turn-over and pattern-drawing device. A combination jar-ramming, squeezing and stripping plate machine also was displayed, together with numerous other examples of modern molding equipment. The use of snap flasks in connection with split patterns and match plates was demonstrated.

The International Molding Machine Co., Chicago, showed air and electric-jarring machines, combination jar-ramming turn-over draw machines, plain turn-over draw machines, stripping-plate machines, stationary and portable power squeezers, combination jolt squeezers and core machines, the latter forming an important feature of the International exhibit.

The Midland Machine Co., Detroit, displayed a light 6-inch jolt-ramming roll-over machine in operation; this machine has lifting capacity up to 1,000 pounds and will handle flasks up to 32 x 42 inches with a 12-inch pattern draw. The other equipment exhibited included a hand roll-over machine, a small core machine and an interesting pneumatic riddle of new design.

The Mumford Molding Machine Co. and Vulcan Engineering Sales Co., Chicago, in addition to displaying the working, sectional model shown at the Chicago convention in 1914, exhibited the Krause electro-pneumatic jolt-ramming machine, which is self contained and provides its own compressed air.

*Roller Ramming Machine*

A roller-ramming machine of an improved type was displayed by Rickey, Brown & Donald, Inc., Maspeth, New York City. The roller is operated by a broken-link rack bar, which enters a pit at the base of the machine. This reduces the floor space required to a minimum. The machine is provided with adjustable sides to permit the use of patterns of varying widths. The drawing plate and pattern are supported by two air springs, thereby balancing the weight and making the operation easy. A standard vibrator is provided and the working parts are enclosed. This machine is specially adapted to molding large flat, plate-like castings.

The Wood system of taper snap flask molding was demonstrated by a working display. This system, developed by T. B. Wood's Sons Co., Chambersburg, Pa., involves the use of taper snap flasks and automatic adjustable snap jackets as described in full in *The Foundry*, September, 1914.

A complete line of pneumatic vibrators ranging from ⅜-inch to 2 inches piston diameter was shown by the Malleable Iron Fittings Co., Branford, Conn. Practical demonstrations of the operation of these vibrators were made.

Modern steel flasks of all sizes were exhibited by the Sterling Wheelbarrow Co., Milwaukee. Successive improvements have made it possible to steadily increase the size of these flasks and it is not believed the limit has yet been reached.

An exceedingly interesting demonstration of the electric furnace was furnished by the Snyder Electric Furnace Co., Chicago, which installed and operated a small steel furnace on the pier. Power was supplied in single-phase form by the local public service company and the necessary transformers and auxiliary apparatus were provided by the Snyder company as a part of the exhibit. Cold scrap was melted and heats

GENERAL VIEW OF EXHIBITS IN ANNEX

were poured three times daily, at 11 a. m., 2 and 5 p. m. The finished castings were cleaned and machined by other exhibitors. Tests of the metal poured from each heat were made in Philadelphia and the results announced the following day. The furnace, which was of the one-ton type, had a capacity of ten tons per 24 hours. The electric furnace is still enough of a novelty in metallurgical circles to attract a large amount of attention, and the Snyder exhibit therefore formed one of the striking features of the 1915 Foundry and Machine Exhibition.

The Monarch Engineering & Mfg. Co., Baltimore, displayed a complete line of furnaces for melting brass and other non-ferrous metals and also for heat treating steel and for tool room use. Among the interesting features of this display was a coke furnace for No. 150 crucibles provided with rotating grate bars. A drop bottom pit or stationary type furnace with shaking grate and a No. 125 crucible tilting combustion chamber furnace also was shown.

The Whiting Foundry Equipment Co., Harvey, Ill., made a pictorial display of its cupolas, together with its other lines of foundry equipment.

*Crucibles of American Clay*

The war in Europe has cut off the customary German sources of crucible clay and consequently crucible manufacturers in this country have been busy during the past year developing American clay deposits. The results have been exceedingsly successful and it is doubtful if many of the manufacturers concerned will revert to the German product after the close of hostilities. Crucibles of American clay have been thoroughly tested and proved satisfactory. In its investigation of American clays, the Jonathan Bartley Crucible Co., Trenton, N. J., tried out over 75 different kinds and found that the best results were obtained by mixing various clays in the proportions necessary to secure the desired results. The Bartley Co. showed used American clay crucibles that had stood from 25 to 50 heats on brass and an average of four heats in crucible steel foundries using oil-burning furnaces of the Milwaukee type.

The Joseph Dixon Crucible Co., Jersey City, N. J., also displayed an extensive line of crucibles and other graphite and clay products which are suitable for use in the foundry. Charles J. Clark, Chicago, demonstrated his well-known blast meter for cupola and malleable furnaces.

The exhibits of cleaning room equipment were very extensive, including all types of apparatus found in the modern foundry for cleaning and finishing castings. The tremendous improvements in sand-blast machinery during the past year or two were graphically portrayed.

An exceedingly complete exhibit of sand-blasting apparatus was made by the Pangborn Corporation, Hagerstown, Md., including 10 pieces of equipment, seven of which were in operation, representing 10 different methods of sand blasting. This equipment included a complete sand-blast room, together with sand-blast tumblers, and machines of the cabinet, barrel and table types. A complete dust exhaust and sand handling system was provided and the apparatus, which occupied almost all of one side of the machinery hall extension, was driven by a specially installed line shaft connected to an electric motor. Castings obtained from the Snyder electric furnace across the aisle and from other sources were sand-blasted and cleaned throughout the week.

A large direct-pressure type sand-blast barrel was displayed by the Mott Sand Blast Mfg. Co., Chicago. The American Foundry Equipment Co. division of the Sand Mixing Machine Co., New York, displayed several new Wadsworth type sand-blasting machines, including an automatic apparatus for the continuous blasting of radiator columns. Among the other concerns exhibiting sand-blast apparatus and cleaning room equipment were the Brown Specialty Machinery Co., Chicago; Cleveland Pneumatic Tool Co., Cleveland; Ingersoll-Rand Co., New York; New Haven Sand Blast Co., New Haven, Conn.; Norton Co., Worcester, Mass.; Carborundum Co., Niagara Falls, N. Y.; J. W. Paxson Co., Philadelphia, and the W. W. Sly Mfg. Co., Cleveland.

A PORTION OF THE MOLDING MACHINE AND SAND BLAST EXHIBITS IN MACHINERY HALL EXTENSION

*Sand Handling Apparatus*

The Hayward Co., New York, presented a working display of an improved clamshell bucket provided with chain drive. The Great Western Mfg. Co., Leavenworth, Kan., displayed the improved Combs gyratory riddle described in detail in the Sep-

tember, 1915, issue of *The Foundry*. A new, low-charging core sand and facing mixer provided with a rotary screen was exhibited by the Blystone Mfg. Co., Cambridge Springs, Pa. It is approximately 11¾ inches lower than the mixer built by this company previously and is, therefore, easier to load. Pneumatic riddles, sand sifters, shakers and other sand handling apparatus also was exhibited by the Brown Specialty Machinery Co., Chicago; Clearfield Machine Shops, Clearfield, Pa.; International Steam Pump Co., New York; National Engineering Co., Chicago; Sand Mixing Machine Co., New York; Standard Sand & Machine Co., Cleveland; W. F. Stodder, Syracuse, N. Y., and the Wyoming Shovel Works, Wyoming, Pa.

Oxy-acetylene welding apparatus was displayed and working demonstrations were made by the Oxweld Acetylene Co., Chicago. The Macleod Co., Cincinnati, also exhibited welding torches, etc. Thermit welding was demonstrated by the Goldschmidt Thermit Co., New York, and interesting electric welding apparatus was exhibited by the General Electric Co., Schenectady, N. Y., the Westinghouse Electric & Mfg. Co., Pittsburgh, and the Lincoln Electric Co., Cleveland. The Westinghouse company fitted up an arc welding room in which a 500-ampere, 75-volt, 800 revolutions per minute outfit was installed; the General Electric Co. also displayed a 300-ampere arc welder of the carbon and metallic electrode type.

Extensive air compressor exhibits were provided by a number of well-known companies and several of the compressors were in operation, furnishing other exhibitors with air. It is evident that the growing use of electric power in foundries is not operating to curtail the foundry consumption of compressed air. On the contrary the demand for air keeps pace with that for more kilowatts. Among the exhibitors of compressors and pneumatic tools were the Cleveland Pneumatic Tool Co., Cleveland; Ingersoll-Rand Co., New York; International Steam Pump Co., New York, and the Union Steam Pump Co., Battle Creek, Mich. The latter showed a number of belt and motor driven foundry type compressors which were provided with glass cover plates to show their interior construction and the effectiveness of the lubrication.

Rogers, Brown & Co., Cincinnati, showed their excellent series of moving pictures covering the manufacture of iron and steel, well known to foundrymen under the name, "From Mine to Molder."

SNYDER ELECTRIC FURNACE WITH PANGBORN EXHIBIT IN BACKGROUND

### *Pig Iron and Coke*

An exceedingly attractive display was provided by the Thomas Iron Co., Easton, Pa. An illuminated panorama of a blast furnace cast, was presented, together with castings manufactured from Thomas vanadium pig iron, including piano plates and other interesting pieces. Reprints of advertisements of Thomas iron that have appeared during the past year in *The Iron Trade Review* and *The Foundry* also were presented.

Pickands-Brown & Co., Chicago, presented a very handsome exhibit of Solvay coke. The coke was artistically arranged to form a representation of the Liberty Bell, about 12 feet high. The bell was flanked by revolutionary American flags. An interesting display of coke and by-products also was made by the Lehigh Coke Co., South Bethlehem, Pa. A coke display was presented by the Graceton Coke Co., Graceton, Ind.

Foundry supplies in great variety were shown by the Buckeye Products Co., Cincinnati; Herold Bros. Co., Cleveland; Hill & Griffith Co., Cincinnati; J. S. McCormick Co., Pittsburgh; S. Obermayer Co., Chicago; J. W. Paxson Co., Philadelphia; Robeson Process Co., New York; Sterling Wheelbarrow Co., Milwaukee; United States Graphite Co., Saginaw, Mich.; Waterbury Welding Co., Waterbury, Conn.; E. J. Woodison Co., Detroit, and the Wyoming Shovel Works, Wyoming, Pa.

Samples of brass ingots, bronze and alloys were displayed by the Ajax Metal Co., Philadelphia; S. Birkenstein & Sons, Chicago; Cataract Refining & Mfg. Co., Buffalo; Titanium Alloy Mfg. Co., Niagara Falls, N. Y.; White & Bro., Philadelphia, and The Foundry Manganese Co., Philadelphia.

Safety shoes, goggles, etc., for foundrymen and others were exhibited by F. A. Hardy & Co., New York; Julius King Optical Co., New York; R. P. Smith & Sons Co., Chicago; Safety First Shoe Co., Boston; Strong-Kennard & Nutt Co., Cleveland, and T. A. Willson & Co., Reading, Pa. The extent, variety and excellence of these displays reflected a tremendous interest in safety devices. Manufacturers are no longer satisfied with goggles

of an indiscriminate character, but on the contrary prescribe rigid specifications that must be adhered to.

*Machine Tools*

This display of machine tools fell short of expectations because all available stock and exhibition machines have long since been exported to Europe or sold to American manufacturers of war munitions and practically every manufacturer is obliged to concentrate his entire energies on the problem of keeping up deliveries.

Nevertheless some very attractive machine tool exhibits were made, prominent among which was that of the Cleveland Automatic Machine Co., Cleveland, which showed a motor-driven 2½-inch full automatic turning machine in operation on large rounds. This machine has a great variety of speeds in both directions. Interesting types of grinding machinery were presented by the Gardner Machine Co., Beloit, Wis., the Norton Co., Worcester, Mass., and Chas. H. Besly & Co., Chicago. The latter showed sanders suitable for use in pattern shops. Other exhibitors of machine tools and machine shop equipment included E. C. Atkins & Co., Indianapolis; Athol Machine Co., Athol, Mass.; Clark Foundry Co., Rumford, Me.; Clipper Belt Lacer Co., Grand Rapids, Mich.; Cowan Truck Co., Holyoke, Mass.; Landis Tool Co., Waynesboro, Pa.; Norma Co. of America, New York; Ready Tool Co., Bridgeport, Conn.; Simonds Mfg. Co., Fitchburg, Mass.; Challenge Machine Co., Philadelphia, and Rock Island Mfg. Co., Rock Island, Ill.

Wood block floors were displayed by the Ayer & Lord Tie Co., Chicago and Jennison-Wright Co., Toledo. An adding and calculating machine was shown by Felt & Tarrant Mfg. Co., Chicago. David Lupton's Sons Co., Philadelphia, exhibited a complete line of products for lighting and ventilating. Pattern shop lumber was shown by the Thos. E. Coale Lumber Co., Philadelphia.

*Returning Prosperity*

The extensive character of the exhibits, the attendance and the volume of business transacted all testified to the return of prosperity to the business interests of the United States. Little apprehension was manifested over the war and it was the concensus of opinion that this country is entering upon a prolonged period of good business.

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The Morgan Welding Co., Youngstown, has leased the old Andrews foundry at Watt street and Erie railroad, that city. Guy Morgan is head of the company.

# Stupid Piece of Legislation

## La Follette Act Vigorously Denounced and Upbuilding of Merchant Marine Strongly Advocated

Henry D. Estabrook, a New York attorney of rare oratorical powers, delivered an eloquent address Sept. 22, to an audience of 600, under the auspices of the Cleveland Advertising Club. He discussed questions growing out of the war and advocated a strong navy and a relatively small standing army. He said that there is no better auxiliary to the navy that a merchant marine, nor is there any instrumentality that contributes more to the glory and riches of the country. He denounced government ownership of ships and also the seamen's bill, saying in part:

The La Follette act is the stupidest piece of legislation in the history of the country, and all who are in any wise responsible for it share in the culpability of its author. It should not be spoken of as an act to encourage our merchant marine, but to abolish it, and to turn our shipping over to Japan, for that will be the sum total of its accomplishment. The LaFollette act was perhaps expected to force employment of only American sailors, at better wages and easier work, amid more luxurious surroundings than any other sailors in the world.

"The fact that to do this involved abrogating treaties with nearly every country, as well as regulating the usages and commerce of that country; the fact that no American shipowner could live up to the requirements of the act and pay the cost of operation, mattered not at all to these Utopians. But the purpose of the act defeats itself. No American sailor will be employed, because there will be no American ship to employ him. To repeal the act will therefore injure no one, not even the American sailor.

"Do we wish the United States to have a merchant marine? Very well, then. How hard do we wish it? The government cannot compel Americans to build ships—isn't that so? It can only coax and tempt and encourage them to build ships—isn't that so? The cheapest encouragement it can offer is to permit our ship-owners to compete on even terms with the ship-owners of the world—isn't that so? If that involves subsidies or their equivalent, then our government must equalize conditions or go without its ships—isn't that so? For our government itself to go into business—well, that has been suggested and even urged by those who ought to know better, but the mocking laugh with which the country greeted the suggestion shows that the people still have some appreciation of the functions and limitations of government.

"Suppose that we had legislators and statesmen patriotic enough, wise enough and brave enough to save some of our agitators from the consequences of their own folly; suppose our government should offer inducements sufficiently alluring to tempt Americans to build their own ships; what do you suppose would happen? Leaving out of consideration the value of a merchant marine as an auxiliary to our navy; leaving out of consideration the inestimable aid to our commerce and international exchange which these ships would give us, let the working men of our country try to realize what various occupation it would furnish them — in mines, forests, factories, forges, shipyard. Why, it would open up new fields of endeavor, it would mean the employment of thousands of workers not otherwise employed. The LaFollette act means the very opposite of all this. It means no American ships and no benefit to the American sailor. Is the American sailor a dog in the manger? If he cannot benefit himself, will he prevent others from benefiting? Is he less than a patriot? I do not believe it, for at the core of him he is every inch a man, with the duty to deserve the title, for it is America's only title for nobility. To acclaim a man a Man—with a capital "M" for emphasis, and the word lengthened by the emphasis, is to honor him in the highest—eulogy can go no further".

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Hendee Mfg. Co., Springfield, Mass., is to go back into the bicycle manufacturing business while continuing to make improved models of the Indian motorcycle. The plans of the company as at present formulated, according to Treasurer Frank J. Weschler, are to manufacture 15,000 bicycles the first year, the cost of the machines ranging from $30 to $40.

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The increasing business at the Pratt & Whitney Co.'s Chicago store has caused it to move its stock of machine tools, machinists's small tools and gauges to larger quarters in the new Sharpless building, corner of Washington boulevard and Jefferson street.

# Engineers Hold Successful Congress

## International Gathering at San Francisco Draws Many Delegates—Many Iron and Steel Papers Presented and Discussed

San Francisco, Sept. 28. (By wire.)—Representatives of the iron and steel industry in attendance at the sessions of the International Engineering Congress in this city last week were greatly interested in the prospects for building up the industry on the Pacific slope, where it has never assumed large proportions. This feature, together with the advance in steel-making through the use of the electric furnace was freely discussed in several papers.

The organizers of the Congress, which included five of the leading engineering societies of the United States, the American Society of Mechanical Engineers, the American Society of Civil Engineers, the American Institute of Electrical Engineers, the American Institute of Mining Engineers and the Society of Naval Architects and Marine Engineers, had arranged to have papers prepared which would give a wide view of the progress in the various industrial fields rather than the results of some particular investigation.

Meetings of the various societies were held the previous week. These conventions were merged in the general meetings of the Congress on Monday, which were presided over by Major General Geo. W. Goethals. Following the general sessions of Monday, the Congress was divided into sections, which held simultaneous meetings, as follows: The Panama Canal; Waterways and Irrigation; Municipal Engineering; Railways; Materials of Engineering Construction; Mechanical Engineering; Electrical Engineering; Mining; Metallurgy; Naval Architecture and Marine Engineering, and Miscellaneous. These sectional sessions were held throughout the week, merging in the closing general session of the Congress on Saturday morning.

The attendance was gratifyingly large and representative. While European countries were not largely represented, due to the war, France, Germany, Spain, Sweden, the Netherlands, Austria-Hungary, Scotland and Switzerland sent noted engineers. Other countries represented were Japan, China, Canada, Guatemala, San Salvador, Mexico, Australia, Brazil, India, Venezuela and Argentina. The total registration of delegates and members was nearly 850.

The Congress has been unique, as it has been a joint meeting of the various engineering societies, at an exposition commemorating the greatest engineering achievement of history, the Panama Canal. The sessions were held in the largest auditorium in the United States, as it can seat 11,000 persons.

The progress made in forging press manufacture; the possibilities of the electric furnace; the fact that some of the manufacturers are starting schools to educate young men in the art of molding to combat the idea of restricting the number of experienced molders; the field for new alloy steels; the opportunities of the steel casting business on the Pacific coast, where scrap iron is abundant and power is reasonably cheap, and the possible advent of fuel oil and natural gas in the industry, were some of the interesting points brought out in the papers and discussion.

### *Machine Shop Methods*

The paper prepared by E. R. Norris, Pittsburgh, on "Machine Shop Equipment, Methods and Processes", was read at the Tuesday session in abstract by Prof. W. R. Eckhart. In the discussion, Carl G. Barth stated that his experience with tools having welded high-speed steel tips, had proved them commercially successful. He did not agree that they were more expensive than solid or butt-welded tools. Under proper conditions, he believed that belt feeds were entirely satisfactory, disagreeing with the conclusion reached in the paper. He had found that the trouble arose from the belts being too small and not being designed to have enough power. Mr. Barth also stated that iron bushings in countershafts have advantages over bronze. He commended the use of water when cutting cast iron in keeping down dust and increasing the efficiency. A statement defending the manufacturers was presented by James Hartness in which he said that they are giving the users what they need and what they want.

A second paper on the same subject, prepared by H. F. L. Orcutt, Rowington, England, was next discussed. Mr. Hartness stated that he considered the writer especially qualified to write on that subject and agreed with him that the human element in machine shop work is to be considered fully as much as the equipment. Mr. Barth added that providing the workmen with the best equipment was giving them the best kind of treatment. Prof. H. B. Langille asked if ball or roller bearings had been successfully used in machine tools. Mr. Barth stated that ball thrust bearings are being used in high speed drills, giving no trouble.

The paper on "Automatics", prepared by Ralph E. Flanders, Springfield, Vt., was read in abstract by Mr. Hartness. L. D. Burlingame called attention to the present competition between automatic and hand-controlled machines and pointed out some of the desirable qualities of the automatic. He stated that many of the difficulties in automatic machine design, such as indexing and stopping the revolving member and keeping the work separated from the chips, had been solved.

"High Temperature Flames in Working" was the title of a paper prepared by H. R. Swartley, Jersey City, N. J. W. A. Doble stated that the paper did not discuss electric welding, which in his opinion, was superior for welding on pipe lines, than those methods mentioned in the paper. A pipe line 42 inches in diameter at Boulder, Colo., leaked at numerous points and could have been welded cheaply by the electric process as current was readily obtainable. He referred to a case where a Y casting in a line under a 900-foot head, had cracked, due to shrinkage strains. It was welded at a relatively slight expense. The cost of replacing the casting would have been large. Only a few days' time was lost. The casting has been in service a year and a half since it was repaired and has shown no signs of re-cracking. He stated that he is following the practice of deliberately cracking the Y castings and thus producing a casting free from shrinkage strains. He also stated that he was constructing them with a V-shaped opening at points where they would be subject to such strains and then electrically welding the openings after the castings are annealed.

The first session, Tuesday afternoon, presided over by Dr. J. W. Richards, was devoted to a symposium on iron and steel, edited by Henry M. Howe. None of the authors of the papers was present, and abtracts were read. The papers on "Steel-Making in the Electric Furnace" and "Electro-Metallurgy" caused

much discussion. Abstracts of a paper on "Iron and Steel Castings", by John Howe Hall, were read by the chairman. J. W. Beckman took exception to the term semi-steel as being a misnomer. He also brought up the point of the use of the X-ray in determining flaws in castings. Geo. C. Carson stated that the addition of aluminum to molten metal tends to obviate holes in castings. He spoke of the difficulty of making deoxidized steel in an acid open hearth furnace. Albert Sauveur's paper on "Metallography and Hardening of Steel" was read in abstracted form by the chairman. G. C. Carson stated that he favored the Chatelier theory of the fluidity of steel. Mr. E. L. Foucar remarked that manganese steel becomes softer on quenching, and that if cooled slowly from a high temperature it becomes harder.

F. Giolitti's paper on "Case-Hardening of Steel" was read in abstracted form by the chairman and was not discussed.

*Duplex Process*

Abstracts of F. F. Lines' paper on "The Duplex Process of Steel Manufacture" were read by Prof. G. H. Clevenger. The point was brought out in the discussion, that proper combinations of the bessemer converter, the open hearth furnace and the electric furnace would soon be largely used for the production of commercial steel, the converter being advantageous for raising the temperature of the steel quickly, the open hearth furnace for keeping up the heat and the electric furnace for ultimate refinement.

"Methods of Preventing Piping in Steel Ingots", by Emil Gathmann, was read in abstracted form by the chairman. It was pointed out in the discussion that crystals are sometimes formed along the walls of the pipe. The practice of not completely deoxidizing the steel was referred to. The possible danger of "bleeding" the ingot if the piping were cropped off, was also raised. Mention was made of cases of segregation of carbon, sulphur and other elements.

Abstracts of the paper on "Steel Alloys" were read by the chairman, reference being made in the discussion to stellite and its cobalt content. Prof. G. H. Clevenger remarked that high speed steel owed its existence largely to the discovery of the proper heat treatment, also to the pushing of the percentage of tungsten to new limits. J. H. Gray's paper on "Steel-Making in the Electric Furnace" was read in abstracted form by the chairman, who declared that the installation of more electric furnaces on the Pacific coast for making steel castings is probable. J. W. Beckman stated that three or four such installations were being planned for Californian cities. The chairman called attention to an electric steel casting plant in Pennsylvania, which bought its power at 1 cent per kilowatt and ran its plant from midnight to 4 o'clock p. m., so as not to interfere with the regular peak lighting load of the power company, declaring that the venture was a profitable one for both the casting company and the power company. The paper on "Electro-Metallurgy", by E. F. Roeber, was read by the chairman in abstract form. The author discussed the electric furnace, electrolytic, and electrolytic furnace processes. He declared that electric furnace pig iron is being produced cheaply in Sweden, where the cost of power is $8 per horsepower year, and that the electric furnace will in future produce pig steel directly from iron ore. In the discussion that followed, J. W. Beckman brought up the question of using electricity in connection with fuel oil or natural gas, also stating that the electric furnace should be efficacious in the handling of refractory ores.

*Materials of Engineering Construction*

On Wednesday a paper on "The Outlook for Iron", prepared by Prof. James F. Kemp, New York, was read in abstract form by Prof. Charles B. Wing in the absence of the author.

"Alloy Steels in Bridge Work" were discussed in a paper prepared by J. A. L. Waddell, Kansas City, Mo. It was read in abstracted form by E. J. Mehren. Attention was called to the use of silicon steel in a bridge across the Ohio river, in which the elastic limit of the steel used was 45,000 pounds per square inch. Mr. Waddell believed that it would be possible to develop an alloy steel having an elastic limit of 80,000 pounds per square inch for the annealed eye-bars and one of 70,000 pounds elastic limit for plates and shapes.

One of the interesting features of the afternoon was a special program in the Court of Abundance, honoring John A. Brashear, who had been chosen as the representative citizen of Pennsylvania. Director Frank L. Brown, of the exposition, presented a commemorative bronze medal to Mr. Brashear.

The paper on "Safety Engineering", by Frederick Remsen Hutton, was read in abstracted form by Mr. Eckhart. Chairman Dickie told of conditions in Sweden, where the costs of accidents had been greatly reduced. Each group of manufacturers pays its own accidents. L. D. Burlingame stated that there were two ways of avoiding accidents, through education of the workmen and by engineering schools. W. C. Linderman thought that safety museums should be installed in all industrial centers. A. L. DeLeeuw presented a paper on "The Influence of the Electric Motor on Machine Tools", which was read by W. J. Davis.

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# Convenes at Fair

**American Society of Mechanical Engineers Discusses Interesting Papers**

San Francisco, Cal., Sept. 25.—The American Society of Mechanical Engineers closed its September meeting here on Saturday of last week. A large number of members of the society attended, most of whom took an active part in the proceedings of the International Engineering Congress this week.

The opening session of the mechanical engineers were described in *The Iron Trade Review* last week. The session on Friday was enlivened by an interesting paper presented by A. H. Goldingham on "The Heavy Oil Engine, Its Present Status and Future Development." The secretary also read an abstract of a paper by W. H. Adams on "The Diesel Engine and Its Applications in Southern California." These two papers were discussed simultaneously. H. R. Sietz expressed the opinion that the life of diesel engines is indeterminate. He believed that a careful study should be made of the fuel oils of the country, particularly those having an asphalt base, and advocated the appropriation of money by the society for carrying on research along this line. C. R. Weymouth stated that the advantage of the diesel engine lay in its economy.

The last paper presented was a discussion of "The Strength of Gear Teeth" by Prof. G. H. Marx and L. E. Cutter. They described tests carried on at the Leland Stanford University, the first of which were reported to the society at its 1912 meeting. At that time the work was criticised owing to the limited scope of the tests. Tests since have been made to determine the values of velocity coefficients; velocity at pitch speeds from 500 to 2,000 feet per minute; influence of the arc of action, and experimental values of factors for the form of tooth as determined by the number of teeth in the gear. The conclusion was drawn that the breaking strength of the teeth does not decrease with increased velocity, at the rate previously assumed.

Fig. 1—Representative Types of Single Houses at Morgan Park

# "Model City" Near New Steel Plant

## Morgan Park, Built at Duluth by Minnesota Steel Co., is Last Word in Industrial Towns—Houses of Concrete and Modernly Equipped Throughout

BY R. V. SAWHILL

WHEN on your next visit to Duluth, step up to any citizen and ask the way to Morgan Park. He will direct you, but there will be a momentary hesitation while he is recalling what the name signifies. Accost the next man and tell him you want to get to the "model city". You will receive the same directions but they will be given instantly.

The difference is significant. Morgan Park is the name chosen by the United States Steel Corporation for the industrial town it has built near the new works of the Minnesota Steel Co., Duluth. After this plant is placed in operation, the name will doubtless take on the vitality attached to a thriving community. Up to the present, however, the name has meant little to Duluth citizens. They are all interested in the new town, and recognizing in it the last word in industrial community building, they have dubbed it the "model city", thereby betraying the pride they take in its being a unit in their widely flung municipality.

If you take the directions of these citizens seriously and visit Morgan Park, the few hours consumed will be well spent. The site, general arrangement and the character of the houses all aid in making the town an unusual one.

It is situated on a bluff overlooking Spirit lake. Excellent work by the landscape architects has enhanced its natural beauty and the use of wide, winding boulevards, lined with rows of maple, elm and ash trees will in a few years make the streets resemble natural parkways. The long rows of concrete houses, with their varied styles of architecture and the shrubbery growing in the front lawns—50 different kinds of shrubs were planted—complete the attractive picture.

The town is named in honor of the late J. Pierpont Morgan, to whose capacity as a banker and genius as an organizer, the formation of the world's greatest business corporation is due. The custom of applying the names of the foremost men in their respective fields of industry to new towns and works communities has become firmly established in the last few years as a gracious method of paying recognition to the unusual abilities of these leaders. The iron and steel industry offers a number of such examples.

The Steel Corporation's experience in the building of Gary, Ind., has been turned to good account in laying out Morgan Park.

The houses are all constructed of cement block, with reinforced concrete floors, 169 residences already having been built. These contain 349 apartments and can furnish accommodations for housing 1,700 persons. Work is now being pushed on four lodging houses or small hotels where single men may board and room. In addition, a large concrete office building and a laboratory for the Minnesota Steel Co. are being constructed. The hotels will have a total of 100 rooms, providing accommodations for 200 men.

Every effort was made to avoid similarity in the types of houses, and to accomplish this eight different styles of buildings were constructed. In addition, 13 different combinations of exterior arrangements were employed. Both green and red stained shingles were used. As a result, none

FIG. 2—FOUR FAMILIES ARE ACCOMMODATED COMFORTABLY IN THIS HOUSE

of the houses shows any similarity in construction to its neighbors.

The first excavation work was done July 31, 1913, and all of the houses now built were practically completed by Nov. 1, 1914. Work since that time has been confined to grading and paving the streets and sidewalks.

The residence streets have 22-foot pavements, 8½-foot grass plots and 4½-foot sidewalks. The pavements, sidewalks and curbings are concrete. The business street is of boulevard type with 22-foot central boulevards for street car tracks, 16-foot roadways on both sides, 7½-foot grass plots and 5-foot sidewalks. All alleys are 16 feet wide, with 8-foot concrete pavements. The streets have electric lights, one 100-watt lamp being placed every 200 feet.

The entire plat includes 179 acres. The houses which have been built occupy 44 acres, so that ample provision has been made for the future growth of the town.

FIG. 3—MANY TWO FAMILY HOUSES WERE BUILT

The single houses, representative types of which are shown in Figs. 1 and 5, are for the highest paid operatives. Three different general types were built, containing five, six and eight rooms, respectively. The other houses include two, four and six family structures containing either four or five rooms. The plans for the first 185 houses to be built, all but 16 of which are completed, called for the construction of the following types: 95 single houses, 30 having five rooms; 55 with six rooms and 10 with eight rooms; 55 two-family houses, 20 with four-room suites and 35 with five-room suites; 25 four-family apartments, 10 with five-room suites on the ground floor and four-room suites on the second floor, and 15 with four-room suites both up and down; 10 six-family types, each suite having four rooms. Each lot has 50-foot frontage and is 125 feet deep.

Each house and apartment has water and sewer connections, electric lights, full basement and separate coal-fired furnaces. All rooms have hardwood floors and birch trim. Owing to the extremely low winter temperatures, double windows are provided. The single houses have tile-front fireplaces with grates for burning coal or wood. Speaking tubes, stationary tubs and facilities of like character which are not usually found in industrial towns are provided. All

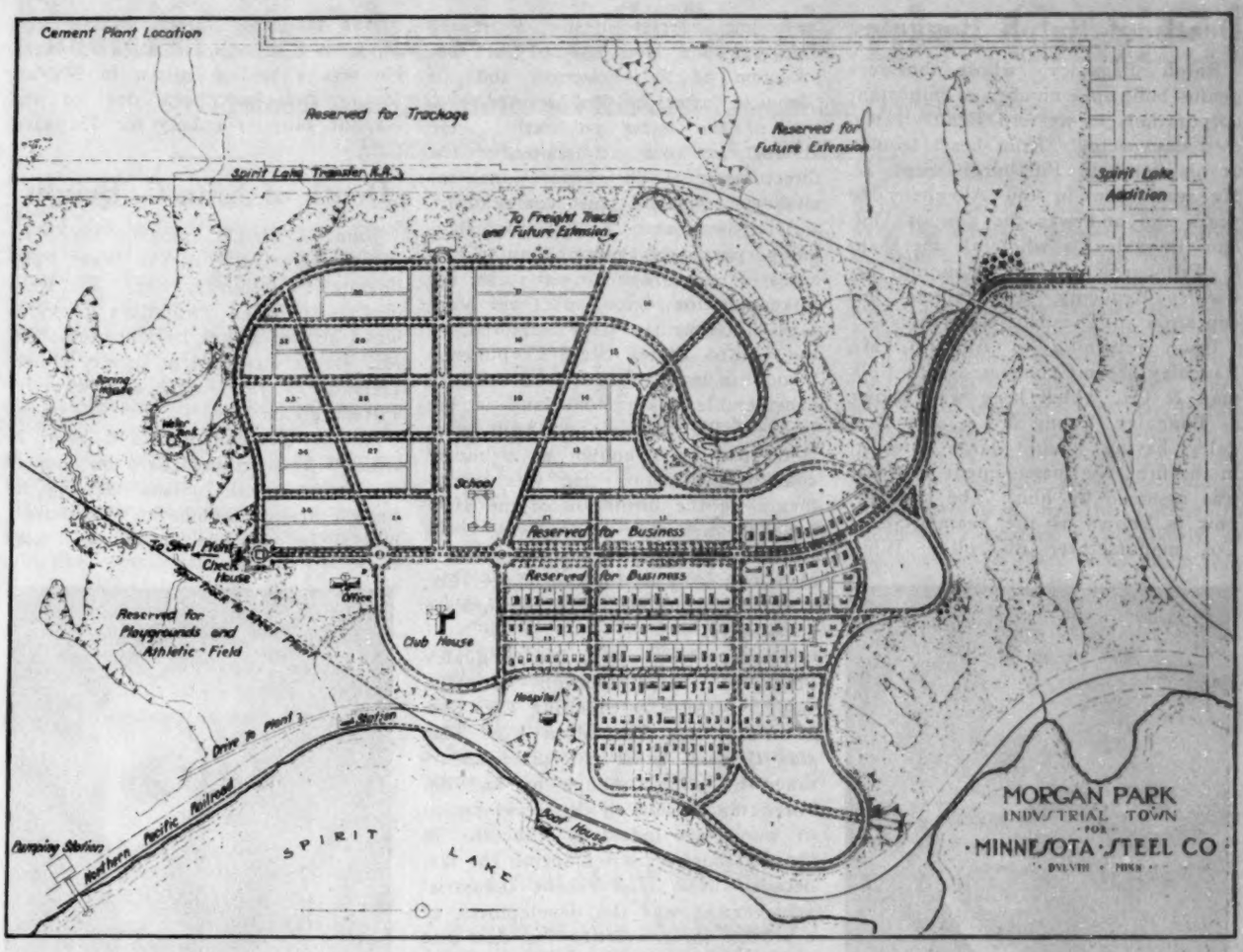


FIG. 4—LAYOUT OF THE "MODEL CITY"

wiring is in underground conduits. Two complete water systems are provided. Drinking water is secured from natural springs while the second system handles the water for sewerage and fire purposes. Laying the pipes for carrying the spring water proved a difficult problem, some mains being only 2 inches in diameter.

Construction will be started this fall on a hospital and school. A community garage also will be built. A section of the principal street has been reserved for business blocks. A boat house probably will be built later on the shores of Spirit lake. It is expected that the street car system of Duluth will be extended to Morgan Park next spring. Service to downtown Duluth now is furnished by the Northern Pacific railroad. The town is a part of the city of Duluth, which city extends for about 35 miles in a general east and west direction.

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**Branch Office.**—A branch office of the T. R. Almond Mfg. Co., of Ashburnham, Mass., has been established at 1257 David Whitney building, Detroit, and will be in charge of Don F. Kennedy, who has been appointed Michigan representative. The increasing business of the company among automobile companies in its lines of flexible steel tubing and drill chucks, has made necessary the opening of the Detroit office. Mr. Kennedy also will handle the business of the Sawyer Tool Mfg. Co., manufacturer of machinists' fine tools, which is under the same management as the Almond company.

FIG. 5—ANOTHER TYPE OF RESIDENCE

## Death of Ralph Baggaley

Ralph Baggaley, whose business genius built up a number of important corporations in western Pennsylvania, died unexpectedly from heart trouble at his home in Pittsburgh, Sept. 23. He was born in old Allegheny 68 years ago and was the son of William Baggaley, a wholesale merchant in Pittsburgh. After attending Sewickley Academy, he completed his education in Dresden, Germany.

Upon returning to America, Mr. Baggaley became connected with Bollman & Co., which later was known as Baggaley, Young & Co., Mr. Baggaley having bought large interests in the firm, the management of which was assumed by him. The company now is known as the Seaman-Sleeth Co., manufacturer of rolls. While

RALPH BAGGALEY

connected with that firm, Mr. Baggaley first met the late George Westinghouse, then a traveling salesman for Anderson, Cook & Co.

When Mr. Westinghouse entered the manufacture of airbrakes, he engaged Mr. Baggaley to superintend the erection of a plant and to have charge of the manufacture of the product. Later, Mr. Baggaley assisted in organizing foreign concerns for the manufacture of the Westinghouse airbrake in Europe. Mr. Baggaley was instrumental in financing the company when it was organized.

He was given personal charge of the Westinghouse Machine Co., which had proved somewhat unprofitable. During the several years he directed its destinies, the company paid dividends of 12½ per cent, a record it had not previously attained.

In 1875, Mr. Baggaley bought a controlling interest in the *Pittsburgh Telegraph* and later effected the consolidation of the *Telegraph* and the *Chronicle*, after he had secured control of the latter publication. He at one time was a member of the directorates of 28 corporations, including banks and trust companies.

After the panic of 1873, Mr. Baggaley purchased more than 27,000 acres of iron ore property in the Lake Superior region, and these holdings subsequently were acquired by the United States Steel Corporation through a lease. In 1880, he obtained considerable coking-coal land in the Connellsville regions and built what since has been known as a model coke-making plant. He was instrumental in the formation of the Hostetter-Connellsville Coke Co., now controlled by the Corporation. He also owned the Puritan Coke Co., which is operated by a corporation subsidiary.

Fourteen years ago, Mr. Baggaley organized the Pittsburgh - Montana Copper Mining & Smelting Co., now known as the Pitts-Mont Co. This was the last great enterprise undertaken by him, although he had devoted much time to the development of numerous industrial concerns in the Pittsburgh district during the last decade. His most recent industrial achievement was the development of a process for converting flue dust into a suitable form for blast furnace use. This process was described on page 358 of the Aug. 19 issue of *The Iron Trade Review*.

In 1879, with the late Henry W. Oliver, he organized the Duquesne Club of Pittsburgh. He also was a charter member of the Pittsburgh Club and was a life member of the American Association for the Advancement of Science, and belonged to the American Institute of Mining Engineers and the American Society of Mechanical Engineers.

Mr. Baggaley is survived by his widow, four daughters and two sons.

## Obituaries

Harry B. Haughton, president and general manager of the Haughton Elevator Co., Toledo, O., died Sept. 23, aged 45 years.

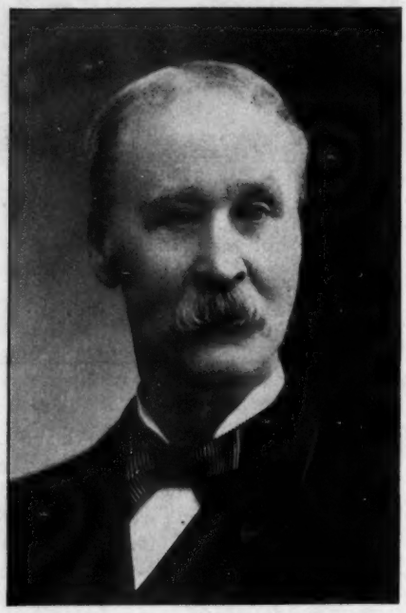
Henry W. Buttorff, president of the Phillips & Buttorff Mfg. Co., of Nashville, Tenn., died in that city recently after a long illness at the age of 78. He had been president of the company, which is one of the largest manufacturers of sheet metal work in the south, since 1881.

George Edwin Strout, vice president of the Tubular Rivet & Stud Co., Boston, died in the summer home of his daughter, Nahant, Mass., Sept. 21, from heart disease, aged 75 years. He was a leading citizen in Malden, Mass., and had been one of the Nahant summer colony for 15 years.

## Death of John G. Bright

John G. Bright, pioneer tin plate manufacturer, died at the West Penn hospital, Pittsburgh, Sept. 23, from injuries received two days previous when he was struck by an automobile. Mr. Bright was born in County Down, Ireland, 79 years ago, and went to Pittsburgh in 1854.

At the close of the Civil War, in which he participated as a member of the Twenty-ninth Indiana Artillery, he moved from Indiana to Pittsburgh, where he became associated with



JOHN G. BRIGHT

Fleming, Agnew & Co., manufacturers of tin ware specialties. He left that interest to assist in the formation of a tin plate plant at Wellsville, O., one of the first tin plate mills in the central west. He acted as secretary of the concern, which later was absorbed by the American Sheet & Tin Plate Co.

**Business Refused.** — Because the company does not care to have anything to do with the manufacture of supplies for war purposes, A. J. Lindemann, president of the A. J. Lindemann - Hoverson Co., stoves and sheet metal products, Milwaukee, has refused to make a bid for the manufacture of 1,000,000 oil stoves to be used for heating trenches during the coming winter. The request for a bid came from a large American contractor.

# Business News of Nation's Capital

## Protocol Signed With Russia Releases Manganese Ore and Other Products—Collecting Facts About Tariffs

Washington, Sept. 28.—By a protocol signed this week by Secretary of State Lansing and the Russian ambassador, American firms, under certain conditions, will be allowed to secure the release of shipments of goods upon which the Russian government, with the outbreak of war, had placed an embargo. Manganese ore, being a Russian product, is, along with other articles, embraced in the shipments which will be released by this protocol.

It will be necessary for American buyers to file application in triplicate with the commercial agent in charge of the New York office of the bureau of foreign and domestic commerce, room 409 custom house, asking for approval for the release of certain shipments of goods from Russia. Forms for making out such applications may be obtained from the bureau or any of its branch offices. In addition, the American purchaser must guarantee that no part of the shipments for which release has been sought will be exported in any form from the United States, and the buyer must file a bond with the proper Russian officers covering the entire value of the shipment. Such a bond must be made out to the Russian government and will run for three years or until peace shall have been declared. In case it is discovered that any part of the shipment has been exported, the bond will be forfeited and the buyer will be prevented from securing further shipments of goods from Russia. Buyers must be willing also, to furnish upon request to the bureau statements showing the sales of all or any part of the shipment of goods covered by such agreement. Approval of the formal applications of American buyers to secure the release of shipments of goods does not guarantee that the goods will be released. The granting of permission for the release of shipments will rest wholly with the authorities of the Russian government. After an application has been approved by the bureau, it will be transmitted to the Russian government, and if permission is granted, it will be necessary for the importer to file his bond with that government.

### No Trust

Washington, Sept. 28.—The department of justice is understood to have completed its investigation into charges that a spelter "trust" existed, which while advancing the price of zinc, which it sold, had depressed the price of the ore, which it purchased. Reason exists for the belief that the department found nothing to substantiate the claims and has abandoned the investigation.

### Tied Up Goods

Washington, Sept. 28.—Great Britain has finally announced through its embassy here that it is ready to receive applications unofficially through the trade advisers of the state department for the release of American goods of German and Austrian origin now held up at Rotterdam by the British orders in council. Goods so held are said to be valued at $167,000,000. It is a well known fact that private attorneys sent from this country to London had succeeded in securing permits for the release of goods tied up at Rotterdam, while unofficial efforts of trade advisers of the state department proved unavailing.

### Data About Tariffs

Washington, Sept. 28.—Unusual activity is being shown nowadays by the bureau of foreign and domestic commerce, department of commerce, in issuing statements making clear to manufacturing interests of the country what its duties and performances are. The bureau apparently takes the position that the manufacturers are not sufficiently acquainted with its work and aims. The position seems to be well justified, and regardless of where the fault lies—if it is a fault—it is the intention of the bureau to give the widest publicity possible to what it is doing, has been doing and proposes to do. Several articles have appeared from time to time in *The Iron Trade Review* pointing out certain activities of the bureau, aimed to aid both the manufacturer and the bureau. While the bureau has always issued statements to the press denoting certain activities, its publicity campaign has recently taken on a much more vigorous aspect, and, in addition to being further detailed in reciting the bureau's work, has been laying stress on the more important duties which are intended to appeal to the manufacturer.

During the past few days, the bureau has, for instance, issued two statements of more than ordinary interest. One dealt with the fact that it has decided to send a trade expert over the country to give information to manufacturers, intended largely to inform them how to expand their export trade. The bureau has, therefore, in addition to enlarging its publicity field, determined to enlarge its activities by getting into personal touch with its constituents—the manufacturers. Another announcement, made today, deals with the matter of accurate information regarding foreign tariffs furnished by the bureau to American exporters. Particularly at this time when there is so much talk of tariff revision, which may or may not be mere talk, and in view of the action last week in New York of the National Foreign Trade Council with regard to tariff reform, is the statement opportune. The visit of the bureau's trade expert, Stanley H. Rose, while proposed as a course of instruction for manufacturers, can be, it would seem, of mutual benefit. The manufacturers themselves, it has been pointed out, could indicate to Mr. Rose what their needs are in the way of a revised tariff, give concrete facts and figures and also make known other necessities for the upbuilding and maintenance of both export and domestic trade.

### Another Fake

Washington, Sept. 28. — Reports that tentative plans for the formation of a "gigantic steel merger" had been submitted to the department of justice were emphatically denied. A similar denial was made by the federal trade commission. Neither the department of justice nor the federal trade commission would give approval or disapproval of such a plan, if one were under way, it was pointed out. It has not been the policy of the department of justice to pass upon the legal status of a consolidation before it is effected and the trade commission has repeatedly stated that it will not be its policy.

### Goes to Corporation

Washington, Sept. 28.—Award of contracts by the Panama canal for 250 tons of angles, beams and channels, and 1,355 tons of plates, ranging in size from one-eighth of an inch to 1 inch was made last week to the United States Steel Products Co., the lowest bidder. J. B. Kendall Co., Washington, was awarded the contract for 240 tons of steel bars.

# Tool Makers Concentrate on Lathes

## Several Large Manufacturers Temporarily Suspend Production of Other Tools Owing to Increasing Demand—Machinists Threaten Strike

DEMAND for lathes for export continues unabated and orders which now are under negotiation include from 3,000 to 4,000 of these machines, most of which will be delivered after Jan. 1, 1916. The largest single order in prospect is one for 1,000 single-purpose lathes, which probably will be closed within the next few days. French, English and Russian buyers continue to scour the market for lathes for quick shipment, but only a few scattered machines are being secured by their efforts. In addition to the large demand for lathes, there is a growing demand from abroad for other tools, particularly milling machines and radial drills. The latter rapidly are becoming scarce, due to the fact that several well-known manufacturers recently have abandoned temporarily the production of these machines in order to go into the manufacture of lathes. In Cincinnati, it is reported, only two of the regular manufacturers of radial drills are now turning these machines out at the same rate as formerly. While domestic demand is not as large as that from abroad, several munition makers are at present figuring actively. The chief inquiry which has come out from a domestic concern is that of the Bethlehem Steel Co., which is in the market for from 300 to 400 heavy duty engine lathes of various sizes. Other concerns, including the International Steam Pump Co., continue to negotiate for lathes for forward delivery, while others are taking unusual steps in order to secure these machines for early use. For instance, the trade was surprised to learn that the E. W. Bliss Co., Brooklyn, last week began work in its own shops on the manufacture of 100 lathes which it will use, when completed, for the production of shells. C. K. Turner & Son, 116 Broad street, New York, have put out an inquiry for 100 lathes for 6-inch shells, 15 horizontal lathes for polishing 6-inch shells, eight blacksmith furnaces, annealing and case-hardening equipment, 33 lathes for 4.8-inch shells, one planer, two cylindrical grinders, two universal millers, one horizontal miller, one shaper, one planer, etc. Wm. Cramp & Sons Ship & Engine Building Co., Philadelphia, has purchased two 30-ton McMyler cranes. The Pennsylvania railroad has purchased one 20-ton crane for installation at West Philadelphia.

### *Big Contracts Pending in Pittsburgh*

Most machine tool dealers in Pittsburgh are shattering records. Purchases of lathes for the manufacture of shells continue heavy. The Standard Steel Car Co. is reported to be in the market for approximately 200 lathes and numerous other concerns are inquiring for equipment. The Carnegie Steel Co. has awarded contracts for three 5-ton cranes for its works at McKees Rocks, Pa. The Republic Iron & Steel Co., Youngstown, has bought one 75-ton electric traveling crane and one 125-ton ladle crane, a coke pusher and leveling machine from the Alliance Machine Co., Alliance, O., for the coke plant at Lansingville. The Petroleum Iron Co. has ordered two 15-ton Alliance cranes. The Shelby Steel Tube Co. has completed plans for doubling capacity of its seamless tube mill at Ellwood City, Pa., and soon will purchase necessary rolling mill and finishing equipment. The Wheeling Steel & Iron Co. has awarded contracts for six hot tin mills for its plant at Yorkville, O., and will buy accessory equipment at an early date. The United Engineering & Foundry Co., Mackintosh, Hemphill & Co. and the Mesta Machine Co., builders of heavy rolling mill equipment, are operating plants at capacity.

### *Will Manufacture Lathes*

Increased output of machine tools, especially lathes, is being maintained in the Chicago district by the entrance of manufacturers who ordinarily are engaged in other lines. Among the recent additions to lathe builders is Chalmers & Williams at Chicago Heights, Ill., manufacturers of mining machinery, who have taken a contract from a Chicago seller for lathes. This company's equipment is such that it is not difficult to alter the output.

Foreign demand for tools seems to be held up somewhat although it is by no means slack and the lull is attributed to negotiations for the European war loan. Some demand is coming out from domestic sources but usually this is traced back as a secondary demand depending ultimately on foreign business. Some buying of tools for garages, machine shops and a few tools by railroads constitute the principal purely domestic business.

Second hand tools are being sought eagerly and prices paid for them are high. At a recent auction of a large size lathe which had been in use several years, $100 more was paid for it than it cost originally.

Machine tool builders in Chicago and nearby cities are operating their plants at as high a pressure as during the summer but new orders are not as frequent and inquiry has fallen off to some degree. Recently a sudden demand for cranes developed and the Pawling & Harnischfeger Co., Milwaukee, took contracts for 11 cranes of five to 20 tons capacity, and for twenty 5-ton wall cranes for the William Cramp & Sons Ship & Engine Building Co., Philadelphia.

### *Machinists Threaten to Strike*

Interest in the machinery market in Cincinnati centers around a threatened strike by machinists. A mass meeting was held Sept. 24, but final action will be taken this week. The machinists' union is demanding an eight-hour day and the same wages as they are now receiving for 52½ hours. All machinists' wages in Cincinnati were voluntarily advanced 10 per cent recently by machine tool makers.

Sales of machine tools continue low, and although the majority of machine tool plants will operate at capacity for several months, the same volume of new business is not in sight. The G. & O. Mfg. Co., New Haven, Conn., has made tentative inquiries in this market for a large list of machine tools. The Pollack Steel Co., which was reported to have secured a large war contract, officially denies this rumor, and states that its factory is running on its regular products.

# *A Dependable Organization*

Because the ancient Greeks were so thorough, they excelled in everything—art, literature, philosophy and athletics. From childhood neither mind nor body was slighted.

"AGATHON"—or ***"highest quality"*** was the goal of each individual—was the goal of each state in the nation.

The complete working force of The Central Steel Company, both office and shop, is made up of specially trained men whose sole duty it is, each one, to see that his particular part in our tremendous organization is performed with perfection.

This splendid body of alert and progressive men, working in as complete and up-to-date a plant as was ever built, and assisted by every conceivable convenience, is producing steel of unprecedented quality—"AGATHON" STEEL.

If you desire steels of highest quality

## "Agathon" Steels Will Serve Your Purpose Best

Any shape you wish

Bars, plain or special for cold drawing or machining.

COLD ROLLING STRIP STOCK
BILLETS SLABS BLOOMS

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| "AGATHON" Chrome Nickel | "AGATHON" Vanadium |
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| "AGATHON" Nickel Steels | "AGATHON" Chrome Steel |
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Our shipping facilities are favorable to speedy delivery anywhere

# THE CENTRAL STEEL COMPANY

MASSILLON, OHIO

Detroit Office, 326-27-28 Ford Building F. Walter Guibert, District Sales Manager

## EASTERN STATES

BARRE, VT.—Central Tool Co. has been incorporated; $5,000 capital stock; by G. E. Bond, Alexander A. Milne, George Hoyt, W. E. Beck, Thomas Carroll, W. W. Parry, C. A. Brown and J. M. Carroll, all of Barre.

BOSTON.—Reynolds-Chellman Electric Co. has been incorporated; $15,000 capital stock; by Chester H. Reynolds, J. Edwin Chellman and George R. Colburn.

WATERTOWN, MASS.—A contract has been awarded for the construction of the United States arsenal. The building will be 115 x 284 feet, brick and steel and fireproof construction throughout.

WORCESTER, MASS.—A contract for the erection of one of the plants of the Wright Wire Co. has been awarded to E. D. Ward. The work will be completed about Dec. 1.

HARTFORD, CT.—Cushman Chuck Co., will ercet a 60 x 130-foot addition to its plant on Windsor street, to be used for the manufacture of small tools.

NEW BRITAIN, CT.—Beaton & Cadwell Mfg. Co., manufacturers of valves, radiator fixtures, gauges, etc., has bought out the Lyman H. Snyder Co., Bristol, Ct., manufacturer of ceiling and floor plates, and is moving the equipment to its local plant. The Beaton & Cadwell Mfg. Co. has been authorized to increase its working capital from $50,000 to $100,000.

BROOKLYN, N. Y.—Meurer Bros., steel barrel manufacturers and owners of an extensive plant at Haywood avenue and Third street, Long Island City, N. Y., will erect a 100 x 150-foot, 1-story frame addition to be used as a machine shop. The estimated cost is $10,000. Louis Allmendiger, 926 Broadway, Brooklyn, is the architect.

NEW YORK.—Pipe Railing Construction Co., Queens, L. I., has been incorporated; $10,000 capital stock; by Maurice Jackson, Mildred Kaplan and Albert Law, 409 E. Thirty-second street. The company will deal in railing, iron, steel and machinery appliances.

POUGHKEEPSIE, N. Y.—The Moline Plow Co. plans an addition to its chilled plow department. N. I. Miliken is manager.

SENECA FALLS, N. Y.—Seneca Falls Mfg. Co. has awarded T. H. McHale & Son, Syracuse, N. Y., a contract for the construction of a plant to consist of a foundry and warehouse and other buildings of fireproof construction to be erected at cost of $115,000.

BUTLER, PA.—Engineers of the state highway department have prepared plans for a viaduct on South Main street. Bids will be advertised within 30 days.

LEBANON, PA.—George W. Mease, contractor, has been awarded a contract for the erection of an addition to the foundry of the Boyd Co. The plant will be erected at Willow and Seventh streets.

PHILADELPHIA.—Ground has been broken for a $50,000, 39 x 69-foot addition to the plant of Felton, Sibley Co., paint manufacturers, located at Fourth and Cherry streets.

PHILADELPHIA. — Baldwin Locomotive Works has been awarded a contract for 13 locomotives by the Texas Pacific railroad company.

PITTSBURGH.—Union Storage Co., which some weeks ago purchased a site on Smallman street, will decide definitely on plans for a cold storage warehouse. It is rumored that the plant will be 154 x 264 feet and will cost about $500,000.

SCHUYKILL HAVEN, PA.—Plant of the Schuykill Haven Foundry Co., recently damaged by fire, will be rebuilt at once.

WASHINGTON, PA.—Capitol Paint, Oil & Varnish Co. is making extensive improvements under the supervision of J. L. Lockhart, president of the company.

WASHINGTON, D. C.—Work has been started on a $400,000, 7-story addition to the Columbia Paper Mfg. Co.

## CENTRAL STATES

BATAVIA, O.—Bids will be opened Oct. 4 by Cleon Searles, auditor of Clermont county, for steel superstructure and flooring for South Milford bridge over the east fork of Little Miami river.

CANTON, O.—E. H. Walker has been awarded a contract for the erection of an $8,000 warehouse for the National Biscuit Co.

CANTON, O.—Wright Wrench & Forging Co., 1425 Barth avenue, S. E., has awarded the Alliance Structural Co. a contract for the $4,000 addition to its plant.

CLEVELAND.—Phoenix Chemical Co. has been incorporated to manufacture compounds and chemicals for case hardening steel; $25,000 capital stock; by Nevill Goff, Charles A. Burr, and others.

CLEVELAND.—The Steel Products Co. will erect a 3-story concrete factory estimated to cost $30,000 at 2206 Parkwood drive. The Sam W. Emerson Co., 1041 Engineers' building, is the contractor.

CLEVELAND.—The Blumenstock & Reid Co. has awarded the F. J. Anders Construction Co., 413 Champlain avenue a contract for an $18,000 storage addition to its provision station and abbatoir at 3261 West Twenty-fifth street.

LANCASTER, O. — Lancaster Automatic Light & Power Co. has been incorporated to manufacture small electrically-driven electric light and power plants for isolated communities. The company will start operating in the Acme Foundry building. The output of the company will be about 200 plants a year.

MANSFIELD, O.—Work has been started on the new plant of the Perfection Bed Spring Co. on Orange street. The building will be a 2-story, 50 x 140-foot, fireproof structure.

MARIETTA, O.—City of Marietta, A. J. Stevens auditor, Joseph W. Frye, director of public service, contemplates the erection of $35,000 electric light plant.

MARIETTA, O.—Chester & Fleming, engineers, Union Bank building, Pittsburgh, are preparing plans and estimates for the proposed water works for Marietta to consist of mains and a 6,000,000-gallon concrete reservoir. D. Okey, is mayor.

MASSILLON, O.—Reliance Mfg. Co. plans a 25 x 100-foot building to be erected on Marsh street.

NILES, O.—Harris Automatic Press Co. has increased its capital stock to $750,000. The company will increase its present capacity and market several presses of a new type.

SEBRING, O.—Sebring Tire & Rubber Co. has been incorporated; $200,000 capital stock; by John S. Hotchkiss, William F. Smith, C. B. Smith and others. A site has been chosen near the Saxon property and a plant will be erected in the near future.

STEUBENVILLE, O. — John L. Means, county auditor, will open bids Oct. 15 for the construction of a reinforced bridge over Goose run, Springfield township. Bids will also be opened at same time for the steel superstructure for bridge No. 1, Flintfield township, near Dillondale, O.

WARREN, O.—The Cleveland, Alliance and Mahoning Valley railroad has completed the survey on the line from Ravenna, O., to Warren and the construction work is expected to go forward immediately, according to a statement made by Superintendent Ellis.

YOUNGSTOWN, O.—Massillon Bridge & Structural Co. has been awarded a contract for the construction of, moving and erecting the Carson bridge over the Mahoning river at Shillings mill at Milton. A steel viaduct will be built over the river to replace the Carson steel bridge.

YOUNGSTOWN, O.—Youngstown Sheet & Tube Co. has awarded the General Electric Co., Schenectady, N. Y., a contract for electrical equipment to the amount of $140,000 including turbo-generators for the bar mills and blast furnaces. The Dravo Construction Co. has been awarded a contract for the construction of foundations and highway approaches to the new coke ovens and the railroad bridge over the Mahoning river. The Riter-Conley Mfg. Co. has been awarded a contract for the steel work for the new boiler house, rod and wire mills.

FAYETTSVILLE, W. VA.—Commissioners of Logan county have awarded the Virginia Bridge Co. the contracts for two county bridges.

SPENCER, W. VA.—The county court has awarded the Luten Bridge Co., Indianapolis, Ind., a contract for a 30-span steel bridge over Flat Fork river, near Harmony.

WHEELING. — The Pennsylvania railroad will start work Oct. 1 on its new station at Wheeling.

WILLIAMSON, W. VA.—A $14,000 bridge will be constructed over the Tug river at Williamson. R. C. Terrell, state road commissioner has announced that work will be started very shortly.

BEDFORD, IND.—E. W. Edwards, auditor of Lawrence county, will receive bids until Oct. 12 for the construction of one bridge in Shawswick township and one in Pleasant Run township.

BLOOMINGTON, IND.—Dr. C. E. Harris of Bloomington has applied for a water works franchise. John G. Harris is mayor.

COLUMBUS, IND.—W. W. Mooney & Sons, tanners, are having plans prepared by Levi Hege for a 4-story 48 x 240-foot addition. This building will be used as an office and warehouse.

COLUMBUS, IND.—W. H. Scott, auditor of Bartholomew county, will open bids Oct. 12 for the construction of four reinforced concrete bridges in Harrison township. Bids will also be opened for the construction of two reinforced concrete bridges one each in Jackson and Clay townships.

FORT WAYNE, IND.—Work has been started on the new addition to the plant of the Wayne Oil Tank & Pump Co. The buildings will be of reinforced concrete and steel. The addition to the boiler house will be a wing 60 x 300 feet. The building that will replace the present frame galvanizing plant and lumber room will be 60 x 200 feet. New machinery will be purchased and installed when the buildings are completed about Dec. 15. A. W. Grosvenor, is the architect.

HUNTINGTON, IND.—The Erie railroad will spend $2,000,000 in double track crossing elimination near Huntington.

LOGANSPORT, IND. — The Logansport Castings Co. has been incorporated; $150,000

# High Speed Steels

## of exceptional value

**Vanadium-Alloys Steel Company**

PITTSBURGH PENNA.

*Say you saw it in* THE IRON TRADE REVIEW

capital stock; by G. W. Bowen, S. R. Chenoweth and J. F. Digan.

MILLER, IND.—Bids will be received until Oct. 20 by the town council for a $14,000 water works plant. Former bids were rejected.

PRINCETON, IND.—Planing mill of the White Lumber Co. was damaged by a $2,500 fire.

BLOOMINGTON, ILL.—Twin Grove elevator was damaged by a $3,000 fire. Arrangements are being made to rebuild at once.

GALESBURG, ILL.—The citizens of Galesburg will vote shortly on a $100,000 bond issue for enlarging the electric light plant.

GRANITE CITY, ILL. — American Steel Foundry Co. plans to start work shortly. Plant has been closed for repairs.

MONTICELLO, ILL.—Bids will be received until Oct. 12 by the city clerk for two duplex steam pumps.

RIVER FOREST, ILL.—Harbeck Miller Construction Co. has been incorporated $10,000 capital stock; by Henry R. Harbeck, Ivan D. Miller and Albert Miller.

ROCKFORD, ILL. — Forest City Wire Works has been reorganized with an increase of capital stock from $5,200 to $25,000. A. J. Holtz, of Rockford Watch Co. will be president and general manager.

SHELBYVILLE, ILL.—The county supervisors have approved the plans for a bridge over the Kaskaskia river to cost $21,000.

SPARTA, ILL.—W. McK. Brown, consulting engineer, Cahokia building, East St. Louis, Ill., is taking bids on a water works system for the city of Sparta, estimated to cost $80,000.

ALMA, MICH.—Republic Motor Truck Co. has started work on a $20,000 addition, which will add 35,000 square feet.

ANN ARBOR, MICH.—Superior Mfg. Co. has taken over the plant of the Ann Arbor Organ Co. thereby doubling capacity. Company will manufacture electric lamps and lighting systems.

BATTLE CREEK, MICH.—W. D. Farley is having plans prepared by M. J. Morehouse, 343 South Dearborn street, Chicago, for a garage, two stories, 152 x 230 feet, of brick and terra cotta with steel girders, costing $100,000.

BENTON HARBOR, MICH.—Benton Harbor Brass & Iron Co. has been incorporated to manufacture brass and iron castings and specialties; $15,000 capital stock; by N. H. Lutes and C. H. Kellerman.

DETROIT.—Herbert Mfg. Co., manufacturer of automobile parts, has increased its capital stock from $300,000 to $500,000.

DETROIT.—Welded Steel Barrel Corporation, B. V. Butcher, manager, will receive bids shortly on a 1-story factory building 65 x 80 feet to cost $5,000.

DETROIT.—International Electric Co. has been incorporated; $25,000 capital stock; by Leroy C. Jolls, John Houghton and George McKay.

DETROIT. — Sturdevant-Murray Co. has increased its capital stock to $150,000. The company has transferred all its machinery to its own building at Mullett and Rivard streets, where it will make small automobile parts.

DETROIT.—Armstrong Specialty Co. has been incorporated to manufacture metal specialties; $25,000 capital stock; by Philip H. Sheridan, Kendrick M. Bom and William P. Armstrong.

GRAND RAPIDS, MICH.—Fox Machine Co. plans to move its plant to Jackson, Mich., where larger quarters will be established.

GRAND RAPIDS, MICH.—Steelclad Auto Bow Co. of Chicago has taken over the plant of the Holland Mfg. Co. and will equip it for its specialty. The concern has a capital of $50,000.

GRAND RAPIDS, MICH. — Grand Rapids Paper Box Co., Bond and Fairbrook avenues, through Robinson & Campau, architects, is taking bids on a 85 x 160-foot, 4-story and basement factory building.

GRAND RAPIDS, MICH.—Raymond F. Smith, 210 Lyon street, who is organizing a company to fabricate structural steel, will be in the market shortly for pneumatic machinery, cold saws, drill presses and motor-drive equipment.

KALAMAZOO, MICH.—Assets of the Kalamazoo Electrotype Co. have been sold to the Crescent Engraving Co. The two plants will be consolidated.

KALAMAZOO, MICH.—Fuller & Sons Mfg. Co., maker of transmission gears and clutches, will erect a 4-story addition, 61 x 100 feet, in which will be installed gear cutting equipment.

MENOMINEE, MICH.—Lloyd Mfg. Co. has plans for additions to plant making it 2-story, 275 x 200 feet.

MINNEAPOLIS.—Barnett & Record, Flour Exchange Building, have the general contract for a new elevator at Milwaukee for the Chicago & Northwestern Railroad Co. About $40,000 worth of electric motors, conveyors and other equipment will be necessary.

MONROE, MICH.—Mills, Rhines, Bellman & Nordoff, architects, 1834 Ohio building, Toledo, O., have prepared plans and are taking bids on a factory and power house for the Weis Fibre & Container Corporation. The factory will be 92 x 224 feet, and the power house 50 x 55 feet.

MUSKEGON, MICH.—Louis P. Knitting is interested in a project to build a 1,700 x 800-foot dock into Lake Muskegon. Plans for railroad storage and refrigerating facilities are included. East Shore Dredging Co. will do all the work.

PETOSKEY, MICH.—City of Petoskey is making an effort to secure a site on lower Bear river for the location of a water power plant for commercial use. Two plants already have been erected for this purpose.

SAGINAW, MICH.—American Banking Machine Co. has been incorporated to manufacture coin operating and vending machines; $110,000 capital stock; by R. T. Hosking and W. H. Howland.

APPLETON, WIS.—Fox River Paper Co., Appleton, is building an addition to its power plant and increasing the steam and hydroelectric output. Company has awarded a contract for two vertical power units of 300 horsepower each to the Allis-Chalmers Mfg. Co., Milwaukee.

ASHLAND, WIS.—Ashland Light, Power & Street Railway Co. has been authorized by the railway commission to issue $100,000 in bonds for the establishment of a steam plant.

ASHLAND, WIS. — Plans are being prepared by Henry Wildhagen, architect, for a new electric light plant for the Ashland Light, Power & Street Railway Co., estimated cost $75,000.

BARABOO, WIS.—Home Lumber Construction Co., is building a 1-story garage and machine shop, 68 x 140 feet of fireproof construction.

CLINTONVILLE, WIS.—Bids are being taken by the municipal waterworks commission for one single, double-releasing valve, corliss engine; one 125 kilowatt power factor; 2,300 volt, alternating current generator. H. Spearbraker is secretary.

GREEN BAY, WIS.—The Nelson-Indra Machinery Co., Green Bay, has been awarded the contract for installing a 350 horsepower corliss engine in the mill of the Schneider-Brown Lumber Co., at Marquette, Mich.

HARTFORD, WIS.—Kissel Motor Car Co. has broken ground for two buildings, one for storage and shipping, 35 x 100 feet, and one for the enameling department, 35 x 110 feet. An office building of four stories will be erected shortly and the present office space will be devoted to manufacturing.

KAUKAUNA, WIS.—William Van Lieshout has purchased a site on Lawe street and will build a brick and steel, 50 x 100-foot garage and repair shop costing about $7,500.

MADISON, WIS. — Union Transfer & Storage Co. is having plans prepared by S. H. Dunford, 10 South La Salle street, Chicago, for a 7-story warehouse with cold storage department, 95 x 157 feet, to cost $110,000.

MADISON. — Contract for furnishing the state of Wisconsin with 200,000 metal license plates for automobiles for 1916 has been awarded to the Borreson Mfg. Co., St. Paul, Minn., at 4½ cents per plate.

MADISON, WIS. — Fort Wayne Electric Works, Madison, Wis., owned by the General Electric Co., Schenectady, N. Y., will be consolidated with the plant operated under the same name by the General Electric in Fort Wayne, Ind. When the decision to concentrate was announced, the Gisholt Machine Co., whose plant adjoins, closed a deal for the plant and equipment and is preparing to take possession. Part of the equipment designed especially for electrical production will be moved to Fort Wayne. The Gisholt company retains nearly all of the employes who do not go to Fort Wayne.

MENASHA, WIS. — International Wire Works, organized at Menasha, Wis., by J. M. Graef, Appleton, is building a factory for the manufacture of wire cloth and screens for paper mills at Menasha. Buildings will be 42 x 66 feet. Full equipment of the Menasha factory will consist of 12 looms, ranging from 100 to 172 inches in width. Company has a capital stock of $25,000.

MILWAUKEE.—Milwaukee Auto Engine & Supply Co. is preparing to enlarge its facilities and has increased its capital stock from $6,000 to $30,000.

MILWAUKEE. — George H. Smith Steel Casting Co. is preparing to erect a shipping room, 65 x 150 feet. The present shipping room will be devoted to other purposes.

MILWAUKEE. — Roberson Electrical Appliance Co. has been incorporated; $10,000 capital stock; by L. C. Roberson, Phil A. Klumb and David C. Madden.

MILWAUKEE.—Milwaukee Bridge Co. was awarded a contract for constructing a steel footbridge over the C. & N.-W. R. R. tracks at Rusk avenue.

MILWAUKEE. — Klug & Smith, Mack building, have been chosen engineers for an addition planned by the Sivyer Steel Castings Co.

MILWAUKEE.—Holabird & Roche, architects, 104 South Michigan avenue, Chicago, are taking bids on separate contracts for the Plankinton office building, four stories, 200 x 420 feet.

MILWAUKEE. — Fred G. Simmons, commissioner of public works is making a survey of machine shop and repair work for the city with the object of establishing a central machine and repair shop.

MILWAUKEE.—A contract for the electrical work in the Milwaukee plant of the Ford Motor Co. has been awarded to the

Stenz Electric Co. The plant will cost about $200,000 and will be opened Dec. 15.

MILWAUKEE.—Wisconsin Bridge & Iron Co. is having plans prepared for a 80 x 270-foot foundry.

MILWAUKEE.—Transmission Research Co. has been incorporated to engage in general engineering work and development of inventions; $25,000 capital stock; by A. D. Whipple, Frank L. Bader and Christ Doerfler, attorney, all of Milwaukee.

MILWAUKEE.—Edmund R. and William G. Spence, of the Rundle-Spence Mfg. Co., plumbers and steamfitters' supplies, have purchased a 4-story, 40 x 120-foot building at 314-316 East Water street and will remodel it for manufacturing purposes.

MILWAUKEE.—Geo. H. Smith Steel Casting Co., 500 Clinton street, Milwaukee, plans finishing and shipping room building, 65 x 150 feet, on a site included in the recent purchase by the company. It is the intention of the company to use all of the present build-

Kratsch Machine Co.'s plant and are making tests.

ROCHESTER, WIS. — The Burlington, Rochester & Kansasville Telephone Co., Rochester, Wis., has increased its capital stock from $10,000 to $20,000 to provide for extensions of lines and exchange equipment.

SHEBOYGAN FALLS.—Falls Machine Co. manufacturer of automobile motors and internal combustion engines, is improving its plant and adding an assembling shop.

SUPERIOR, WIS.—Railroad commission of Wisconsin has ordered Northwestern Coal Co. of Superior to reconstruct its viaduct over East Second street. The work is to be completed Jan. 1.

WASHBURN, WIS.—Barksdale plant of the Dupont Powder Works near Washburn, is continuing to enlarge. Seven sulphuric acid producers are being constructed.

WATERTOWN, WIS.—Watertown Table Slide Co., Harp street, Watertown, Wis., is preparing to erect a woodworking factory

two shapers; spiral gear hobber to take gears up to 30 to 36 inches; a 54-inch special boring mill with revolving head; 30-inch Bullard or equal vertical turret lathe; 4 and 6-inch radial drills; three sensitive drills; Jones & Lampson flat turret, small and 3-inch size, Heald grinder; Newton or Lucas horizontal drilling and boring machine; gas-fired hardening furnace with electric pyrometer.

CALMAR, IA.—Calmar Electric Co. has been incorporated; $15,000 capital stock; by Andrew Latimer, George A. Wood and Arthur H. Latimer.

MARSHALLTOWN, IA.—Bids will be received by W. S. McFarland, superintendent of the water works, on a 4,000,000-gallon pump costing about $12,000.

SIDNEY, IA.—Bids will be received until Oct. 5 for water works improvements including a 200-gallon per minute triplex power pump and 35-horsepower internal combustion engine. G. T. Hatten is mayor.

WATERLOO, IA.—Illinois Central Railway,

## Trade Opportunities of Particular Merit

*Bethlehem Steel Co., South Bethlehem, Pa., has issued an inquiry involving from 300 to 400 heavy duty engine lathes of various capacities.*

*Standard Steel Car Co., Frick building, Pittsburgh, is reported to be in the market for approximately 200 lathes.*

*Wheeling Steel & Iron Co., Wheeling, W. Va., has awarded contracts for six hot tin mills for its plant at Yorkville, O., and will purchase accessory equipment at an early date.*

*Shelby Steel Tube Co., Ellwood City, Pa., has completed plans for doubling the capacity of its seamless tube mill at Ellwood City, and will soon purchase the necessary rolling mill and finishing equipment.*

*Fore River Ship Building Corporation, Quincy, Mass., which took bids on two 15-ton locomotive cranes, has postponed final action in regard to the purchase of this equipment.*

*American Smelting & Refining Co., 120 Broadway, New York City, will take bids on a 60-ton electric traveling crane.*

*Panama Canal, general purchasing officer, Washington, D. C., will receive bids until Nov. 3 for one 50-ton locomotive crane for installation at dry dock No. 1, Balboa Terminal, Canal Zone.*

*Fuller & Sons Mfg. Co., Kalamazoo, Mich., manufacturer of automobile parts, is in the market for gear cutting, milling and drilling equipment, as well as some special tools.*

*Haynes Automobile Co., Kokomo, Ind., is in the market for tools to equip an addition.*

*Cheboygan Electric Light & Power Co., Cheboygan, Mich., will install a 250-horsepower auxiliary plant adjoining the gas plant, for use in emergency and during low water. F. B. Spencer is secretary and manager.*

*City of Little Rock, Ark., will spend about $25,000 for electrical equipment, including five transformers.*

*American Scale Co., Pleasant Hill, Mo., is building a branch at Kansas City, Mo., for which foundry equipment is needed.*

*Waterworks and sewerage board of the city of Clarksburg, W. Va., will receive bids until Oct. 21 for two gas engines and two punches for installation in the pumping station. Scotland G. Highland is secretary of the board.*

*Cincinnati Grain Co. will erect an elevator and warehouse for which conveying and elevating equipment will be needed.*

ings for foundry purposes. The company produces alloys steels, including manganese, vanadium, nickel and chrome.

MILWAUKEE. — Barnett & Record Co., Flour Exchange, Minneapolis, Minn., has been awarded a contract for the erection of the superstructure of the new 2,500,000-bushel grain elevator to be erected in Milwaukee by the Chicago & North-Western railroad. Elevator will be of reinforced concrete and steel construction and cost about $600,000.

NEENAH, WIS.—Edwin Hofstedt has established the Hofstedt Saw & Machine Co. at Neenah. New concern will specialize in saw repair and fitting and also has an installation of welding and cutting equipment and will also operate a general machine and repair shop.

OSHKOSH, WIS.—Negotiations are under way for the establishment of a plant in Oshkosh for the manufacture of farm tractors using either gasoline or kerosene as fuel. A. J. and O. G. Patch, tractor designers, have completed several models at the Dauber-

addition, 30 x 100 feet, and a new dry kiln, 40 x 135 feet. Some woodworking machinery will be required.

CAMPBELL, MO.—Campbell Electric Light & Power Plant has been incorporated; $30,000 capital stock; by Ben F. Eicholz, R. C. Jones and W. E. Glenn.

HANNIBAL, MO. — Hannibal Wire Fabric Co., care of E. E. Heindel, will start shortly to erect a factory including an annealing oven and paint tower, 140 x 300 and 50 x 150 feet, costing $125,000.

KANSAS CITY, MO.—Rector Gas Heating Co. has been incorporated; $100,000 capital stock, by George H. Opdyke, O. M. Edmonsen and Paul W. Bradly.

PLATTSBURG, MO. — Bonds for $50,000 have been voted for water works and sewer building, E. B. Murray & Co. are engineers, 920 Walnut street, Kansas City, Mo.

ST. LOUIS.—Fulton Iron Works is inquiring for the following machine tools: Four 14, 18 and 24-inch geared head engine lathes;

A. S. Baldwin, chief engineer, Chicago, will make improvements at its shops here at an expense of $180,000.

WATERLOO, IA.—Kelley Mfg. Co. was damaged by a $25,000 fire. Company manufactures steel tanks, culverts and portable garages.

MINNEAPOLIS.—Plant of the Co-Operative Barrel Mfg. Co. was damaged by a $3,500 fire.

MONTEVIDEO, MINN. — The Minnesota Valley Power Co. has plans for buildings and equipment to be installed at Minnesota Falls at an estimated cost of $20,000.

SLAYTON, MINN.—Slayton Power Co. will enlarge its plant and add a 100-horsepower engine, oil, steam or producer gas, also a generator and switchboard. F. H. Eddy is manager.

ST. PAUL.—Brown Sheet Iron & Steel Co. is planning to erect a plant.

ST. PAUL.—Plans will be ready Oct. 1, having been prepared by C. H. Johnston, 715

Capital Bank building, for a steel frame historical building, to cost $500,000. Downer Mullen, secretary state board of control, is in charge.

## SOUTHERN STATES

ROANOKE, VA.—Norfolk & Western railroad contemplates the erection of a grain elevator, to cost $1,000,000.

CHARLOTTE, N. C.—George W. Graham Jr., Charles P. Moody, and others, interested in a flour mill, have awarded J. A. Jones a contract for a plant to be erected at the junction of the Seaboard Air Line and Southern railroads.

COLUMBIA, S. C. — Charleston Southern railroad has been chartered in the state of South Carolina with its headquarters in Darlington. The company will operate an 86-mile line. The board of directors includes George E. Dargen, Darlington, S. C., Bricht Williamson, president and James D. Evans, both of Florence, S. C.

ATLANTA, GA.—Atlanta Steel Works will increase its capacity by the installation of a third open hearth furnace. Thomas K. Glenn is president.

AUGUSTA, GA.—The capacity of the International Cotton Mills Co., Hogansville, Ga., will be doubled by the installation of 5,000 spindles, contracts for which have been placed. Plans are being prepared for a 2-story addition to the plant and the erection of a warehouse with a capacity of 5,000 bales of cotton. It is stated that about $250,000 will be expended by the company in these improvements.

GADSDEN, ALA.—Preparations are being made by the Gulf States Steel Co. to increase its capacity. Machinery is being added to the $60,000 soaking pit addition and barb wire machines for the wire department have been ordered.

NEW ORLEANS.—Ground has been broken for a 150 x 300-foot plant at Hagan avenue and Gravier street for the American Sheet Metal Works.

DALLAS, TEX. — Ruud-Humphrey Water Heater Co. of Texas, has been incorporated; $10,000 capital stock; by F. A. Lemke, D. A. Hardie and J. W. Barber.

DENISON, TEX. — Southwestern Power Light & Railway Co., W. T. Croslen, president, will begin the construction of an electric railway from Denison to Oklahoma City, Oct. 1.

EL PASO, TEX.—Plans have been completed for the erection of an addition to the plant of Portland Cement Co. Estimated cost of buildings is $500,000.

HOUSTON, TEX.—Garner Regin Machine Co. has been incorporated; $10,000 capital stock; by Herbert Godwin, James C. Garner and Edgar L. Pearson.

HOUSTON, TEX.—Mayor Campbell has announced that an additional 3-story warehouse will be erected on the wharf near the turning basin.

LITTLE ROCK, ARK.—City of Little Rock will spend $25,000 for electrical equipment, including five transformers.

LITTLE ROCK, ARK.—Hugh R. Carter, state highway engineer, has completed plans for a 240-foot steel span bridge near Lewisville.

LITTLE ROCK, ARK.—Bids will be taken soon by county commissioners for widening and strengthening the Main street bridge at a cost of $200,000.

CHATTANOOGA, TENN.—Chattanooga Gas & Coal Products Co. will spend about $150,000 in construction and equipment of a benzol by-products plant.

CHATTANOOGA, TENN. — Chattanooga-Tennessee River Power Co., now operating hydro-electric plants on the Tennessee river, will build a water-power plant on Duck river near Shelbyville, Tenn.

CHATTANOOGA, TENN. — Nashville, Chattanooga & St. Louis railroad, general offices in Nashville, Tenn., will build machine shops at Chattanooga. Power-operated incline for transfer of river freight to cars will be constructed.

HENDERSON, TENN.—City of Henderson will purchase equipment for electric light plant with proceeds from $13,000 bond issue.

LENOIR CITY, TENN.—Lenoir City will vote shortly on a $10,000 bond issue for the construction of a water works system.

MEMPHIS, TENN.—American Auto Jack Co. has been incorporated; $10,000 capital stock; J. E. Richards, Harry N. Watson and P. H. Pierce.

NASHVILLE, TENN. — Equipment will be installed by Nashville Bridge Co. for the manufacture of shrapnel shells.

NASHVILLE, TENN.—Brantley-Ellis Automobile Co. will install an alternating current motor or gasoline engine and air compressor.

ASHER, OKLA.—The Asher Bridge Co. has been incorporated; $5,000 capital stock; by W. M. White, D. F. Christ, and E. L. Majors, all of Asher.

CHICKASHA, OKLA. — H. A. Cranwell, county engineer, is preparing plans for a $50,000 bridge over the Canadian river near Minton.

OKLAHOMA CITY, OKLA. — Triumph Valve Mfg. Co. has been incorporated; $6,000 capital stock; by William Grandsden, C. H. Lindley and O. K. Corkon.

## WESTERN STATES

LINCOLN, NEB.—Plattner-Yale Mfg. Co. has had plans prepared for a factory, including a machine shop 52 x 200 feet, a foundry 50 x 150 feet, to accommodate the core room and brass foundry. The company is located at Denver and is a manufacturer of implements.

OMAHA.—Armour & Co. will make $250,000 worth of improvements to its plant in South Omaha, including car shops.

OMAHA.—John L. Kennedy will build and lease to P. H. Philbin a 14-story hotel, 66 x 132 feet, construction work to start April 1. Estimated cost is $500,000.

ORD, NEB.—Bids will be received until Oct. 1, by John C. Work, mayor, for the construction of an electric light plant cost $22,000. Bruce, Standever & Boynton are the engineers, 430 Bee building, Omaha.

TEKEMAH, NEB.—A. G. Howard, manager of the municipal electric light plant, is preparing to buy a 150-horsepower corliss engine, two boilers and a 100-kilowatt generator and switchboard.

MILAN, KAS.—Nathan L. Jones, Smith building, Wellington, Kas., is preparing plans for a municipal electric light plant.

GREAT FALLS, MONT. — Great Falls & Southwestern Railroad, Carbon Coal & Coke Co. has been incorporated to build a line from Ulm, Mont., to mouth of Hound river; $750,000 capital stock. Line will be 60 miles long and will handle coal deposits.

LIBBY, MONT.—Libby Electric Light & Water Co. will make extensive improvements to plant. Kirby & Reynolds, Sheridan, Wyo., are the owners.

DENVER.—Jackson Compressor Co. announces it will build an additional plant here in connection with its present factory. H. O. Jackson is president, 1130, Twelfth street.

PUEBLO, COL. — Nuckolls Packing Co. plans the erection of a $250,000 plant. G. Harvey Nuckolls is president of the company.

ABERDEEN, IDA.—Aberdeen city council purposes the installation of a water works system. H. C. Weibe is village clerk.

BLACKFOOT, IDA.—F. V. Riley, engineer, Idaho Falls, proposes the construction of a lighting system to be operated by a Diesel engine. The council committee will investigate.

KENDRICK, IDA.—A franchise has been granted to A. V. Dunkle, Plummer, Ida., for the installation of a $10,000 electric light plant.

SHELLY, IDA.—The construction of a municipal electric lighting system is under consideration by the town trustees.

BREMERTON, WASH.—Bids will be received until Oct. 16 by the bureau of docks and yards for three steel tanks each of 1,250,000-gallon capacity for Puget Sound navy yard.

COLFAX, WASH. — Washington Water Power Co. will start work shortly on the construction of a sub-station.

ELLENSBURG, WASH. — Ellensburg city council has awarded the Kraner Construction Co., Portland, Ore., a contract for the construction of a lighting system. Work will be started when the $60,000 bond issue has been authorized.

EVERETT, WASH.—City council has been authorized to investigate possibility of power plant for Sultan river. Plant with 60,000 horsepower is being considered.

HOOPER, WASH. — Oregon, Washington Railroad & Navigation Co. has completed plans for the construction of a 210-foot steel span bridge over Palouse river.

PUGET SOUND, WASH.—Bids will be received until Oct 12 by the bureau of supplies and accounts, navy department, Washington, D. C., for electric-driven pumps for the navy yards at Puget Sound.

RENTON, WASH. — Pacific Electric Welding & Mfg. Co. has purchased a building and will install machinery for the manufacture of electric welding machines, sheet metal and ornamental iron work. Hugo Thornblade is president, 4176 Arcade building, Seattle, Wash.

RIDGEFIELD, WASH.—Gilbert & Hall, Portland, Oregon, are preparing plans for a water works plant, including a 500-gallon pump. J. W. Blackburn is town clerk.

RIVERSIDE, WASH.—New bids will be received until Oct. 10 by the county commissioners on a steel bridge over the Okanogan river, former bids having been rejected.

SEATTLE.—Salmon Bay Foundry Co. has been organized by John Wehn, R. Reddick and others and is planning to build a foundry.

SEATTLE. — Nettleton-Bruce-Eschbach Co., Leary building, has been awarded a contract for a steel bridge over Umatilla river, Oregon.

SEATTLE. — Valveless Engine Corporation has been incorporated to manufacture a special type of engine; $100,000 capital stock; by R. A. Bloom, H. E. Johnson and G. T. Mogan.

SEATTLE.—J. D. Ross, superintendent of the city lighting department, is investigating six projects with a view to securing city power.

SEATTLE.—City bridge engineer will have plans ready Nov. 15 for a bridge over Lake

Washington canal, double leaf bascule, 216-foot span, 80 feet wide, costing $500,000.

SEATTLE.—Bowerman & McClay, consulting engineers, Mutual Life building, are preparing plans for a 260-foot and a 60-foot span steel bridge over the Okanogan river.

SEATTLE.—Contract for the construction of the second steel freighter for the New York & Cuba Main Steamship Co. has been awarded to the Seattle Construction & Dry Dock Co. The capacity of this steamer will be 5,000 tons deadweight.

SPOKANE, WASH.—Superior Furnace Co. has been incorporated; $50,000 capital stock; by N. L. Carroll, A. P. Harold, and others.

SPOKANE, WASH.—Spokane Ornamental Iron & Wire Works is to be reorganized and new capital put in. Plant will be overhauled and new machinery installed.

TACOMA, WASH.—Tacoma Heating Co. will start construction soon on the first unit of its central heating plant. This unit will develop 4,000 horsepower. The total estimated cost is $200,000.

TACOMA, WASH.—Tacoma Railway & Power Co. has applied for a franchise to construct and operate an electric line along the Steilacoom boulevard from the state hospital to the town of Steilacoom.

TACOMA, WASH.—Cornell Bros. have been awarded a contract for the construction of four steel buildings for the Tacoma Smelter Co. Contract for the steel has been awarded to the Kansas City Bridge & Iron Co. The estimated cost of construction is $1,500,000.

BAKER, ORE.—The plant of the W. H. Eccles Lumber Co. was damaged by a $30,000 fire. Plans are being prepared to rebuild at once.

EUGENE, ORE.—City of Eugene will construct a steam-operated electric plant as an auxiliary to the hydro-electric plant, estimated cost is $50,000.

EUGENE, ORE.—Plans and specifications for a bridge to be constructed by Lane county over the north fork of the Suislaw river, between Florence and Acme, have been prepared by H. W. Libby, county engineer. The bridge will be 650 feet long trestle type, with a 40-foot draw.

MARSHFIELD, ORE.—Williamette Pacific Railway Co. will build repair shops and a round house at Marshfield.

ROSEBURG, ORE.—Council is considering issuing $250,000 in bonds for a water works and electric light plant.

SUMPTER, ORE. — Power house will be erected for dredge No. 1 of the Power River Gold Dredging Co.

CORONA FARMS, CAL.—Supervisors of Riverside county have announced that an appropriation of $12,000 has been made for construction of a steel bridge over Santa Anna river north of Corona Farms. When completed the bridge will connect Ontario, Cal., and Corona Farms, forming a link of state highway.

EMERYVILLE, CAL. — Ground has been broken for the first of six units of the Marchant Calculating Machine Co. When completed the plant will cost about $300,000. A. H. Marchant is secretary of the corporation.

GRASS VALLEY, CAL.—Machine shops and round house of the Nevada County Narrow Gage Railway Co., damaged by fire Aug. 30, will be rebuilt at a cost of $40,000.

KENNETT, CAL.—Bonds for $15,000 have been voted for the city's share of a bridge over Sacramento river which is to be built by the county.

LOS ANGELES.—Beardsley Electric Co., manufacturer of electric automobiles, Volney S. Beardsley, president, will build a plant at Culver City near Los Angeles.

LOS ANGELES.—Chevrolet Motor Co. will build an assembling plant and machine shop near Los Angeles. R. C. Durant is manager.

LOS ANGELES.—Beardsley Electric Co. is having plans prepared for a 2-story factory, 60 x 180 feet. to cost $12,000. Arthur S. Heineman, 831 San Fernardo building, is architect.

MARE ISLAND, CAL.—Bids will be received until Sept. 28 by the bureau of supplies and accounts, navy department, Washingtonton, D. C., for a riveting machine and circulating pump.

OAKLAND, CAL.—E. H. E. Frisell is at the head of a new concern which will be known as the California Steel Works. A steel fabricating plant will be erected in Oakland.

OCEANSIDE, CAL.—Bonds for $12,000 have been voted for a municipal water works plant.

PASADENA, CAL.—Plans have been prepared by Grable & Austin, 27 South Raymond avenue, for a machine shop for E. R. Braley to cost $11,000.

RIVERSIDE, CAL.—California Iron Works, Fred. Stubbler, manager, will build a foundry and machine shop.

SAN DIEGO, CAL.—Ort Iron Works has been incorporated; $25,000 capital stock; by J. C. Ort, F. VanHorst and J. H. Moore.

SAN DIEGO, CAL.—John T. Flynn, representing an eastern shipbuilding concern, is preparing to lease 20 acres of tide lands for a shipbuilding plant to cost $500,000.

SAN FRANCISCO.—Boden Automatic Hammer Co., 156 Second street, manufacturer of automatic nail driving devices, is preparing to build a larger factory at Palo Alto, Cal.

SAN JOSE, CAL.—Warehouse of J. J. Johnson and plant of Averill Machine Works were damaged by fire causing losses of $30,000 and $20,000 respectively.

SANTA BARBARA, CAL. — Bonds for $350,000 have been voted for bridges on the state highway.

SANTA MONICA, CAL.—Citizens will vote soon on issuing bonds for $712,500 for a municipal water works.

SCOTIA, CAL.—State highway commission has announced that an appropriation of $40,000 has been made for the construction of a steel span bridge over Eel river at Scotia.

YUBA CITY, CAL.—The county surveyor has been instructed by the county commissioners to prepare plans for a steel drawbridge over the Feather river at Nicholaus, to cost $75,000.

TONOPAH, NEV. — The plant of the Campbell-Kelly Foundry Co. recently damaged by fire will be rebuilt.

## CANADA

DAWSON, YUKON TER. — Yukon Gold Co. will install a steam dredge for operation in the placer grounds.

DAWSON, YUKON TER.—Auburn Gold Mining Co., Seattle, Wash., has purchased the interests of J. Lucien Labbe, Dawson, and will spend about $100,000 on equipment.

ST. JOHNS.—New Brunswick Metals, Ltd., recently incorporated with $98,000 capital stock, by J. A. DeCew, of Montreal, and others, will establish a foundry at St. Johns.

MONTREAL.—T. & K. Industries, Ltd., recently incorporated with $50,000 capital stock, will erect a factory to build machinery and tools. E. LaFontaine and H. J. Trikey are interested.

## NEW CATALOGS

BABBITT METALS.—A 16-page booklet issued by the Lumen Bearing Co., Buffalo, N. Y., discusses the character of various commercial alloys of lead and tin and describes various babbitt metals made by the Lumen company.

CORLISS ENGINES.—The Nagle Corliss Engine Works, Erie, Pa., recently published a unique 80-page catalog containing testimonials from users of its engines. In addition, a list is published of the firms in whose plants these engines have been installed, the list being graded by states, sizes of engines and products.

TURRET LATHES.—The Gisholt Machine Co. has issued a 40-page catalog describing its turret lathes and accessory tools, with a review of the principal features of construction and many illustrations, including installations of Gisholt machines, views of operations performed by Gisholt lathes, and parts finished by them.

SHOP FURNACES.—An 8-page bulletin issued by the American Shop Equipment Co., Chicago, describes portable oil-burning rivet forges; stationary rivet forges for oil or gas fuel; oil or gas-consuming flue welding furnaces and end and center heat forge furnaces; annealing, hardening, tempering, case hardening, and oil tempering furnaces for gas or oil; also a portable heating torch. Descriptions of the equipment are accompanied by illustrations.

SHEETS.—In a 20-page illustrated catalog, the Newport Rolling Mill Co., Newport, Ky., calls attention to its line of sheet metal products. The catalog contains a complete summary of the advantages of this company's sheets, together with an interesting chart showing the results of a comparative corrosion test. The catalog is printed in six colors. A number of service photographs are presented.

TOOL STEEL. — The International High Speed Steel Co., 99 Nassau street, New York, has issued an attractively printed 56-page booklet on high speed steel. In addition to data regarding the various tool steels manufactured by this concern, the booklet contains a large amount of valuable information regarding high speed steel tools, including directions for forging, hardening, tempering, etc. Various standard heat treatments also are presented, together with a color scale.

PRESSES.—The Standard Machinery Co., Auburn, R. I., has issued an unusually complete 148-page catalog covering a full line of power presses for performing various operations on sheet metal. A number of pages are devoted to small single-acting presses after which double-acting presses are illustrated and described. Interesting information also is presented covering a large number of presses for special purposes, such as sprue cutting, stamping, embossing, etc.

WATER TUBE BOILERS.—The A. D. Granger Co., 90 West street, New York City, has issued the sixth edition of its bulletin No. 2, describing Oswego internally fired water tube boilers. The latest features of this type of boiler are described and illustrated. A number of the various buildings, factories, etc., where Oswego boilers are installed, are presented. Tables giving the dimensions, ratings and other data for both high pressure and low pressure boilers, are included.

# IRON AND STEEL PRICES

**Corrected up to Tuesday noon**

## PIG IRON

(Delivery to Dec. 31.)

| | |
|---|---|
| Bessemer, valley | $16.00 |
| Bessemer, Pittsburgh | 16.95 |
| Basic, Pittsburgh | 15.95 |
| Basic, eastern Pa. | 17.00 to 17.50 |
| Malleable, Pittsburgh | 15.45 to 15.95 |
| Malleable, first half, Pbgh. | 15.95 |
| Malleable foundry, Chicago | 15.00 to 15.50 |
| Malleable foundry, Philadelphia | 16.75 to 17.25 |
| Malleable foundry, Buffalo | 15.50 to 16.00 |
| No. 1X foundry, Philadelphia | 16.75 to 17.00 |
| No. 2 foundry, Pittsburgh | 15.45 to 15.95 |
| No. 2 Fdy., first half, Pbgh. | 15.95 |
| No. 2 foundry, first half, valley | 15.00 |
| No. 2 foundry, Cleveland | 15.00 to 15.30 |
| No. 2 foundry, Ironton | 14.50 to 15.00 |
| No. 2 foundry, Chicago | 14.25 to 14.75 |
| No. 2X foundry, Philadelphia | 16.25 to 16.75 |
| No. 2X fdy., N. J. tidewater | 16.25 to 16.75 |
| No. 2X foundry, Buffalo | 15.50 to 16.00 |
| No. 2 plain, Philadelphia | 15.50 to 15.75 |
| No. 2 plain, N. J. tidewater | 15.75 to 16.25 |
| No. 2 plain, Buffalo | 15.00 to 15.50 |
| No. 2 southern, Birmingham | 11.50 to 12.50 |
| No. 2 southern, Cincinnati | 14.40 to 15.40 |
| No. 2 southern, Chicago | 14.50 to 15.00 |
| No. 2 southern, Phila. delivery | 15.50 to 16.00 |
| No. 2 southern, Cleveland | 15.50 to 16.00 |
| No. 2 south'n, New York docks | 15.50 to 16.00 |
| No. 2 southern Boston, docks | 15.50 to 16.00 |
| No. 2 south. interior, New Eng. | 16.50 to 17.50 |
| No. 2 southern, St. Louis | 15.90 |
| Virginia No. 2X furnace | 13.25 to 13.50 |
| Virginia 2X, Philadelphia | 16.00 to 16.75 |
| Virginia 2X, Jersey City | 16.35 to 17.10 |
| Virginia 2X, Boston points | 16.50 to 17.25 |
| Gray forge, eastern Pa. | 15.25 to 15.50 |
| Gray forge, Pittsburgh | 14.95 to 15.20 |
| Gray forge, first half, Pbgh. | 15.20 |
| Gray forge, Birmingham | 9.00 |
| Silveries, 8 per cent, Jackson, O. | 17.00 to 17.50 |
| Silveries, 5 per cent Birmingham | 13.00 |
| Silveries, 8 per cent, Chicago | 20.00 to 20.50 |
| Standard low phos., Phila. | 24.00 to 24.50 |
| Lebanon low phos., furnace | 20.00 |
| Low phos., Pittsburgh | 24.00 to 24.50 |
| Charcoal, Lake Superior, Chgo., Nos. 1 to 4 | 16.25 to 16.75 |
| Charcoal, Buffalo | 16.75 to 18.25 |
| Charcoal, Birmingham | 21.50 |

## IRON ORE

**Lake Superior Ores.**
(Lower lake ports.)

| | |
|---|---|
| Old range Bessemer, 55 per cent. | $3.75 |
| Mesabi Bessemer, 55 per cent. | 3.45 |
| Old range, non-Bess., 51½ per cent. | 3.00 |
| Mesabi non-Bessemer, 51½ per cent. | 2.80 |

**Foreign Ores.**
(Per unit Philadelphia.)
(Prices nominal.)

| | |
|---|---|
| Foreign Bess., 50 to 65 per cent. | 8 to 8½ |
| For'n non-Bes., 50 to 65 per cent. | 8 to 8½ |

## COKE

(At the ovens)

| | |
|---|---|
| Connellsville furnace | $1.70 to 1.75 |
| Connellsville fur. contr. | 1.90 to 2.00 |
| Connellsville foundry | 2.30 to 2.60 |
| Connellsville fdy. contr. | 2.40 to 2.70 |
| Wise county furnace | 2.00 to 2.25 |
| Wise county foundry | 2.40 to 2.60 |
| Pocahontas furnace | 2.00 to 2.50 |
| Pocahontas foundry | 2.25 to 2.50 |
| New River, foundry | 2.50 to 3.25 |
| New River, furnace | 2.25 to 2.50 |

## FERRO ALLOYS AND STEEL MAKING METALS

| | |
|---|---|
| Ferro mang., furnace (prompt) | 110 to 115 |
| Ferro mang., Balti. (future) | 100.00 |
| Spiegeleisen 20 per cent, furnace | 28.00 |
| Ferro-silicon, 50 per cent, Pbgh. | 73.00 to 75.00 |
| Ferro-silicon, 50 per cent, Phila. | 73.00 to 75.00 |

Bessemer ferro-silicon, 9 per cent to 10 per cent, $19.50; 10 to 11 per cent, $20.50; 11 to 12 per cent, $21.50; 12 to 13 per cent, $22.50 a ton at the furnace at Ashland, Jackson and New Straitsville, O.

Ferro-chrome, 4 to 6 per cent carbon, 20 cents per pound; 2 per cent carbon, 40 cents per pound, delivered.

Ferro-vanadium, $2.25 to $2.30 per pound of contained alloy, Pittsburgh.

Ferro-carbon titanium, 8 to 12½ cents per pound in carloads.

Nickel, 50 to 55 cents per pound.

## Freight Rates via Panama Canal

Rates on finished materials, including plates, shapes, bars, wire, nails, etc., to Pacific coast points via Panama canal, per 100 lbs., in carload lots, exclusive of insurance and dockage.

| | |
|---|---|
| From New York | $0.40 |
| From Pittsburgh | .619 |
| From Youngstown | .619 |
| From Niles | .619 |
| From Wheeling | .619 |
| From Steubenville | .619 |
| From Johnstown | .604 |
| From Coatesville | .545 |
| From Steelton | .555 |
| From Bethlehem | .529 |
| From Cleveland | .65 |
| From Chicago | .765 |

Ferro-tungsten, nominal, at $3 to $3.50 per pound of contained alloy.

Cobalt metal, $1.60 to $1.75 per pound, Pittsburgh.

Aluminum, 55 cents per pound, New York.

Ferro-molybdenum, Pittsburgh, nominal.

## SEMI-FINISHED STEEL

| | |
|---|---|
| Open hearth billets, Phila. | $30.00 to 32.00 |
| Forging billets, Phila. | 34.00 to 38.00 |
| Forging billets, Pbgh. | 35.00 |
| Forging billets, Chgo. | 32.00 |
| Wire rods, Pittsburgh | 29.00 to 30.00 |
| Bess. bill., Youngstown | 24.00 to 25.00 |
| Open hearth billets, Youngstown | 25.00 to 26.00 |
| Bessemer billets, Pittsburgh | 25.00 |
| Open hearth billets, Pittsburgh | 26.00 |
| Bess. sheet bars, Youngstown | 24.00 to 25.00 |
| Op. h'th sheet bars, Youngstown | 25.00 to 26.00 |
| Bess. sheet bars, Pittsburgh | 25.00 to 26.00 |
| Op. h'th sh. bars, Pbgh. | 26.00 to 26.50 |
| Muck bar, Pittsburgh | 27.00 to 28.00 |

## RAILS AND TRACK MATERIAL

| | |
|---|---|
| Stand. Bess., rails, Pbg. & Chgo. | 1.25c |
| Stand. op.-h'th rails, Pbg. & Chg. | 1.34c |
| Light rails 8 to 10 lbs. Pbgh. | 1.40c |
| Light rails 8 lb. Chgo. | 1.31c |
| Light rails 12 to 14 lbs. Pbgh. | 1.35c |
| Light rails 12 lbs. Chgo. | 1.26c |

## Freight Rates, Pig Iron

| | |
|---|---|
| **Mahoning and Shenango valleys to:—** | |
| Cleveland | $0.95 |
| Newark, N. J. | 2.98 |
| Boston | 3.18 |
| Philadelphia | 2.78 |
| Pittsburgh | .95 |
| St. Louis | 3.18 |
| **Buffalo to:—** | |
| Albany, N. Y. | $1.26 |
| New England (all rail) | 2.58 |
| New York and Brooklyn (all rail) | 2.58 |
| New York and Brooklyn (by canal) | 1.25 to 1.60 |
| **Virginia furnaces to:—** | |
| Boston docks (r. and w.) | $3.05 |
| New England (all rail) | 3.25 |
| New York dock (r. and w.) | 2.88 |
| **Birmingham, Ala., to:—** | |
| Cincinnati | $2.90 |
| Chicago | 4.00 |
| Cleveland | 4.00 |
| Louisville, Ky. | 2.65 |
| New York (all rail) | 6.15 |
| New York (rail and water) | 4.25 |
| Philadelphia (all rail) | 5.20 |
| Philadelphia (rail and water) | 4.00 |
| Pittsburgh | 4.90 |
| Savannah, Ga. | 2.75 |
| **Chicago, to:—** | |
| Des Moines | $2.80 |
| Milwaukee | .50 |
| Moline, Ill. | 1.40 |
| Omaha | 3.58 |
| St. Louis | 1.58 |
| **Ironton and Jackson, O., to:—** | |
| Chicago | $2.54 |
| Cincinnati | 1.26 |
| Cleveland | 1.62 |
| Detroit | 1.81 |
| Indianapolis | 1.58 |

| | |
|---|---|
| Light rails 16 to 20 lbs. Pbgh. | 1.30c |
| Light rails 15 to 20 lbs. Chgo. | 1.21c |
| Light rails 25 to 45 lbs. Pbgh. | 1.25c |
| Light rails 25 to 45 lbs. Chgo. | 1.16c |
| Relaying rails, standard, Pbg. & Chgo. | $23.00 to 24.00 |
| Relaying rails, light, Chgo. | 21.50 to 22.50 |
| Angle bars, st. sect. Pbgh. base. | 1.50c |
| Angle bars st. sections, Chicago | 1.50c to 1.75c |
| Spikes, railroad, Pbgh. | 1.50c to 1.60c |
| Spikes, railroad, Chgo. | 1.65c to 1.75c |
| Track bolts, Pbgh. | 2.10c to 2.25c |
| Track bolts, Chgo. | 2.10c to 2.25c |
| Tie plates, Chgo. | 30.00 to 32.00 |

## SHAPES, PLATES AND BARS

| | |
|---|---|
| Structural shapes, Pittsburgh | 1.35c to 1.40c |
| Structural shapes, Chgo. | 1.54c to 1.59c |
| Structural shapes, Philadelphia | 1.559c to 1.659c |
| Structural shapes, New York | 1.559c to 1.619c |
| Struc. shapes, San Francisco | 2.00c to 2.05c |
| Tank plates, Chicago | 1.49c to 1.59c |
| Tank plates, Pittsburgh | 1.35c to 1.40c |
| Tank plates, Philadelphia | 1.509c to 1.559c |
| Tank plates, New York | 1.519c to 1.569c |
| Bars, soft steel, Pittsburgh | 1.35c to 1.40c |
| Bars, soft steel, Chicago | 1.54c to 1.59c |
| Bars, soft steel, Philadelphia | 1.509c |
| Bars, soft steel, New York | 1.519c |
| Hoops, carloads, Pittsburgh | 1.50c |
| Bands, Pittsburgh | 1.35c to 1.40c |
| Shafting, Pbgh., contr. car loads | 62 off |
| Bar iron, Chgo. | 1.35c |
| Bar iron, Philadelphia | 1.459c to 1.509c |
| Bar iron, New York | 1.469c to 1.519c |
| Bar iron, Cleveland | 1.35c to 1.40c |
| Bar iron, Pittsburgh | 1.45c |
| Hard steel bars, Chicago | 1.30c to 1.35c |
| Smooth finish, mchy. steel, Chi. | 1.68c |

## SHEETS AND TIN PLATE

| | |
|---|---|
| No. 28, black, Pittsburgh | 2.00c |
| No. 28, black, Chicago | 2.14c to 2.19c |
| No. 28, tin mill, black, Pbgh. | 1.85c |
| No. 28, galvanized, Pbgh. nom. | 3.50c to 3.75c |
| No. 28, galvanized, Chgo. | 3.79c |
| No. 10, blue anld., Pbgh. | 1.60c |
| No. 10, blue, annealed, Phila. | 1.659c to 1.759c |
| Tin plate, 100 lb., coke base. | 3.10c to 3.20c |

## EXTRAS FOR SHEET OR TIN MILL SPECIFICATIONS

(Per hundred pounds.)

| | |
|---|---|
| Single pickled, cold roll, and re-anl. | 30 cents |
| Hot roll'd pick'd and anl., tin mill | 25 cents |
| Full pickl'd, cold rolled and re-anl. | 50 cents |
| Auto sheets | 75 cents |
| Blued stove pipe stock | 10 cents |
| Range steel | 30 cents |
| Re-squaring | 10 cents |
| Roller leveling | 10 cents |
| Patent leveling and re-squaring | 35 cents |
| Oiling sheets | 10 cents |
| Deoxidizing | 10 cents |
| Lime finish | 10 cents |
| Open-hearth stamping steel, free from mill scale | 55 cents |
| Special open hearth deep stpg. steel free from mill scale | 80 cents |
| Extra deep special auto body stock | $1.25 |
| Ext. for 28 gage ov. 32 to 36-in. wide | 10 cents |

No reduction for sheets not annealed.

The above extras apply on both sheet and tin mill specifications, at the same rate.

## IRON AND STEEL PIPE

(Pittsburgh.)

| | Black. Butt-weld. | Galv. Butt-weld. |
|---|---|---|
| Steel, ¼ to 3 inches | 79 | 63½ |
| Iron, ¼ to 2½ inches | 71 | 52 |
| | Lap-weld. | |
| Steel, 2½ to 6 inches | 78 | 62½ |

## BOILER TUBES

| | |
|---|---|
| Steel, 3½ to 4½ inches l. c. l. | 72 |
| Iron, 3½ to 4½ inches l. c. l. | 61 |

## WIRE PRODUCTS

(Retailers' price 5 cents above jobbers' quotation.)

| | |
|---|---|
| Wire nail jobbers, Pittsburgh | $1.75 |
| Plain wire, jobbers, Pittsburgh | 1.60 |
| Galvanized wire, jobbers, Pbgh. | 2.30 |
| Polished staples, Pbgh. | 1.90 |
| Galvanized staples, Pbgh. | 2.60 |
| Barb wire, painted, jobbers, Pbgh. | 1.90 |
| Barb wire, galv., jobbers, Pbgh. | 2.60 |